W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

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Limoneira Laboratory

Report for week ending January 5.

We have received in the laboratory 30 additional water samples, making our total 530 since July 1.

Mr. Scofield has been here this past week. He is devoting most of his time to an investigation of the ash constituents of boron-injured leaves.

We have just completed the boron determinations on a series of soils from the Imperial Valley. The work shows that boron is present but in small amounts. The highest value was 3.1 parts per million and the lowest 1.3 parts per million calculated on the dry weight of the soil. All of these soils have low saturation points, probably not over 10 per cent. Citrus growing in these soils all showed boron injury, and grapefruit leaves from the soil containing 1.3 parts per million showed 840 parts per million of boron on the dry weight of the leaves. Normal leaves contain usually less than 100 parts per million of boron.

A sample of water from the Salton Sea was analyzed this week. The conductance was 4380×10^{-5}, which is equivalent to about 3.80 per cent total salt. We found 3.0 parts per million of boron and 18,992 parts per million of chloride.

Francis Scofield and the writer spent Monday and Tuesday of the week ending January 12 at the Citrus Experiment Station at Riverside. We visited the Rubidoux Laboratory and saw the work that is being carried on there in connection with the boron problem. Dr. Eaton has several very interesting culture experiments in progress.

The analysis of a sample of water from the Pacific Ocean was completed this week. The conductance was 5040×10^{-5}, which is equivalent to about 3.57 per cent total salts. We found 1.85 parts per million of boron and 18,830 parts per million of chloride.

A series of ten samples from flowing wells in the Imperial Valley show from 2 to 3 parts per million of boron. The conductances range from 171×10^{-5} to 367×10^{-5}. There is very little calcium present in these samples. These wells are not used for irrigation.

L. V. Wilcox.

Prosser

A poultry show was held in Yakima during the week ending January 5. Many birds were on exhibit. The judge, Mr. Greenfield, of Butte, Montana, who was a station visitor, reported that flocks and individuals from this project compared most favorably with those from other parts of the country.

All field work has been closed at this station during December and January, but there has been no extremely cold weather. The minimum for the last two weeks was 10 degrees above zero. This occurred on January 3.

Recent snow and rain has made the open feed lots wet and mucky. The stock seem to be making good gains, however, and are gradually consuming more feed.

Prosser (cont'd)

The work in the office has consisted chiefly of preparation of material for the annual report, which is now about finished.

The total shipments of fruit from the valley on December 31 amounted to 18,517 cars according to the Yakima Valley Traffic and Credit Association. This is a high figure, exceeding the record of all former years. The sales of Yakima Valley apples reported by the U. S. Market Service on January 2 showed Fancy Stock Romes at $1.35, Delicious Extra Fancy at $2.40 and Fancy at $2.00 to $2.10, and Winesaps Extra Fancy at $1.70.

C. C Wright.

Scotts Bluff

Under date of January 5 Mr. Holden reported as follows on conditions in the North Platte Valley:

"While there was no extremely cold weather during December, a large part of the snow which fell on Thanksgiving Day is still on the ground. For the month of December the temperatures were: Maximum 50, minimum —5, and mean 21. The precipitation was .09 of an inch.

"Practically all crops were harvested in good condition except that most beet tops were unpiled when the snow came on Thanksgiving Day and they are still under the snow. During October and the first part of November it was very dry, so dry that potato digging was rather difficult, but since then considerable moisture has fallen; so that the soil should be in fine condition next spring. While a large part of the winter wheat in the dry land sections was seeded in dry dirt and did not germinate until the latter part of November, it is now in fine condition.

"Range cattle are doing fairly well even though a considerable part of the grass has been covered with snow. The snow was not crusted, so the cattle had but little trouble in getting to the grass.

"About the same number of cattle and lambs are being fed in the valley as a year ago. Up to this time very few lambs have been shipped out. Prices of fat lambs are beginning to strengthen and the present indications are that lambs will be profitable. Of course, if at any one time too many are rushed on the market, it is likely to break.

"Cattle feeders are not doing so well, especially those who bought heavy steers during August and September. I know of three and four year old steers which sold as high as $190 per head on the range. These heavy steers were put into lots to be fed for a period of 60 to 100 days, but before many of them came back the market price had fallen as much as $4.00 a hundredweight, so that most of them are showing a loss.

"This break in the market for fat cattle took the life out of the feeder and stocker trade, especially the heavy steers. Light yearlings and calves showed this slump to a smaller extent and are now in popular favor with buyers. Even yet the prices of range cattle are high and the future outlook is favorable.

"Hogs have been poor property during most of the year. For a while in September they were perhaps showing a profit, but in most other months they have shown a loss. We sold a car of mighty good shotes yesterday at $7.65 per hundredweight.

Scotts Bluff (cont'd)

"The prices of butter-fat and poultry products are holding up good; and the farmer with a few good cows, a flock of hens, and a few turkeys, who gives them the proper care, is doing better than the farmer who doesn't have them.

"The crops for the valley were just fair. The yield of sugar beets was lower than was expected, being about one ton per acre less than last year, and the price paid by the Sugar Company was $7.00 as against $8.00 last year. The yield of small grain was good but prices were low. The alfalfa yield was rather low due to winter-killing, but the quality was very good with prices as high as $12 per ton in the stack. Potatoes were a disappointment. The yield was good and the quality fair, but the price is very low. Potatoes have sold as low as 35 cents a hundredweight in new sacks loaded on cars. Very few have been sold as high as 60 cents a hundredweight. Many acres of potatoes were not dug, and there are thousands of bushels which were dug and put into silos or ricks that will never reach the market. The potato crop will show a financial loss this year unless prices soon change for the better. The acreage was rather large.

"Due to this potato situation the financial condition of the Valley is not so good as it has been during the three previous years. Business houses are not, as a rule, doing as large a business as usual; and those who extend credit are having more difficulty in collecting.

"Things at the station are going along in good shape. We are building a new calf and bull barn, which will soon be completed."

The average maximum temperature for the week ending January 5 was 32, with a maximum of 44 on December 30; the average minimum was 14, with a minimum of 6 below on January 5. A large part of the snow which fell on Thanksgiving Day is still on the ground.

During the week the men were busy looking after the livestock and working on the new calf barn. One of our cows just finished a seven-day test in which she produced 30.002 pounds of butter and 645.3 pounds of milk.

The total sales of poultry during the month of December were $352.52; $127.38 of this amount was for eggs and $225.14 was for turkeys.

The Great Western sugar factories have just closed their campaign after a run of three months. The run is reported as very successful. The sugar content of the beets was unusually high, but the yield per acre was less than was expected. The average acre yield was 12.13 tons.

The yield per acre of sugar beets at the Experiment Farm was good, varying from 8.75 tons from the continuous cropped plot in field K to 26.26 tons from a manured plot in field E. The average yield per acre from the 13 acres was 18 tons. The two following tables give the yields from the quarter acre plots in fields K and E.

Scotts Bluff (cont'd)

Yield of Sugar Beets from Field E - 1928

Manured plots	Weight	Per cent Tare	Pounds Tare	Net weight	Tons per acre
	Pounds			Pounds	
I - 7	11,330	8	906	10,424	20.85
I - 8	11,625	8	930	10,695	21.39
I - 9	11,455	7	802	10,653	21.30
I -10	11,475	7	803	10,672	21.34
I -11	10,455	7	732	9,725	19.44
II - 7	11,125	8	890	10,235	20.47
II - 8	12,280	8	982	11,298	22.59
II - 9	13,260	9	1,193	12,067	24.13
II -10	14,430	9	1,298	13,132	26.26
II -11	12,980	8	1,038	11,942	23.88
Rotations					
13	11,110	6	666	10,444	20.88
15	11,710	8	937	10,773	21.54
19	9,880	8	790	9,090	18.18
33	11,835	8	899	10,936	21.77
41	11,720	8	938	10,782	21.56
43	11,140	8	891	10,249	20.49
46- D	12,270	8	982	11,240	22.58
46- B	8,215	8	657	7,558	15.12
47	11,165	8	893	10,272	20.54

Yield of Sugar Beets from Field K - 1928

Rotation No.	Weight	Per cent Tare	Pounds Tare	Net weight	Tons per acre
	Pounds			Pounds	
2	4,755	8	380	4,375	8.75
18	4,895	8	392	4,503	9.00
20	5,695	8	456	5,240	10.47
21	10,880	8	876	10,010	20.02
22	5,195	8	416	4,779	9.55
23	11,670	8	934	10,736	21.47
30	5,495	8	440	5,055	10.11
31	11,670	8	934	10,736	21.47
32	5,560	8	455	5,105	10.23
40	7,060	8	565	6,495	12.99
42	8,500	10	850	7,650	15.30
45-1	9,945	8	796	9,149	18.29
45-2	9,190	9	827	8,363	16.72
60	8,535	8	683	7,852	15.70
61	11,745	8	940	10,805	21.61
62	8,930	10	893	8,037	16.07
64	12,395	18	2,231	10,166	20.32
71-1	10,890	8	871	10,019	20.03
71-2	11,435	8	915	10,520	21.04

Scotts Bluff (cont'd)

The average maximum temperature for the week ending January 12 was 38, with a maximum of 51 on the 9th; the average minimum was 14 with a minimum of zero on the 6th. No precipitation was recorded. Considerable snow from the Thanksgiving storm is still on the ground.

The men were kept busy looking after the livestock, working on the calf barn, and hauling baled straw.

The following prices prevailed during the week: Alfalfa hay, $10 to $11 per ton; corn at elevator, $1.65 per hundredweight; barley, $1.40 per hundredweight; butterfat, 45 cents per pound; eggs, 35 cents per dozen; and potatoes, 50 to 60 cents per hundredweight.

The potato market has strengthened a little, but it is still very unsatisfactory to the grower. A large part of the potatoes shipped from the Valley are going south for seed.

The following tables give the yields of potatoes from the irrigated rotations in field K and field E. The highest yield was 443.3 bushels from rotation 61, and the lowest was 96 bushels from the continuous potato plot. The average yield from the 15 plots in field K was 319.2 bushels per acre, and the average yield from the 6 plots in field E was 416 bushels per acre. The quality of the potatoes from field E and from the alfalfa rotation in field K was good, while those from the shorter rotations in field K were so scabby that they were unmarketable.

Yield of Potatoes from the Irrigated Rotation Experiments - 1928
Field K

Rotation No.	Yield per acre		
	Total	Culls size	Marketable size
	Bushels	Bushels	Bushels
4	96.0	28.8	67.2
20	193.3	12.0	181.3
21	384.0	15.4	368.6
24	185.3	16.7	168.6
25	359.3	21.5	337.8
26	165.3	19.9	145.4
27	340.0	27.2	312.8
30	232.1	17.4	214.7
31	414.7	29.0	385.7
40	341.3	5.2	336.1
44	347.3	5.3	342.0
60	422.5	10.5	412.0
61	443.3	11.0	432.3
64	442.7	13.3	429.4
71	420.7	16.8	403.9
Average	319.2	16.7	302.5

Scotts Bluff (cont'd)

The following shows the beneficial effect of manure and of alfalfa on the yield of potatoes in the irrigated rotations in field K.

	Yield per acre, bushels		
	Check plots	Manured rotation	Alfalfa rotation
Number of plots	5	4	6
Maximum	232.1	414.7	443.3
Minimum	96.0	340.0	341.3
Average	174.4	374.5	403.0

Yield of Potatoes from the Irrigated Rotation Experiments - 1928
Field E

	Yield per acre		
Rotation No.	Total	Culls size	Marketable size
	Bushels	Bushels	Bushels
17	373.3	11.2	362.1
33	426.0	12.8	413.2
41	443.2	13.3	429.9
43	436.8	13.1	423.7
46	408.8	12.2	396.6
47	408.0	12.2	395.8
Average	416.0	12.4	403.6

James A. Holden.

Yuma

For the two-week period ending January 12 the maximum temperature was 72, the minimum 22, and the greatest daily range 41. No precipitation was recorded.

The coldest period of the winter seems to have passed with a minimum of 22 recorded on the morning of January 7. This low temperature caused much concern to local citrus growers. A survey of the groves a few days after the freeze failed to show any serious damage, however. Temperatures as low as 25 were recorded on the Yuma mesa.

Cotton ginning on the project continues; 852 bales were turned out last week. The total ginnings to date are 26,020 bales. The McKinnon gin at Somerton, Arizona, burned down last week with a reported loss of $20,000. Picking prices are being advanced to speed up the harvesting of the remainder of the cotton crop.

Lettuce shipments continue with prices holding up fairly well. Alfalfa hay, baled and f.o.b. cars at Yuma, was quoted above $20 a ton during December. There is very little alfalfa hay or alfalfa straw available.

During the first week of January the discharge of the Colorado River at Yuma reached the low record of 1150 second-feet; but as this low river was temporary, it caused no serious concern in the Imperial Valley. The canal for that valley normally diverts about 6,000 second-feet.

Yuma (cont'd)

Station work performed during the last two weeks has included the plowing of land for cotton; renovating alfalfa plots; seeding alfalfa and sweet clover; cleaning and repairing ditches; pruning trees and shrubs; and general irrigating and hoeing.

The number of tourists visiting the station this winter has been much larger than usual.

E. G. Noble.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

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Limoneira Laboratory:

The routine work in the laboratory has progressed satisfactorily during the week ending January 19. We have now handled in this part of the program 570 water samples and about 20 additional leaf samples since the laboratory started last July.

Two interesting soil samples were completed last week. They are from the Fallon (Nevada) Experiment Farm, plot Y-4, near the north end. They were taken July 25, 1928, by Mr. Scofield. One, taken from a depth of 18 inches, was found to contain 7.4 parts per million of boron, and the other at a depth of 36 inches contained 20.2 parts per million of boron referenced to the dry weight of the soil. An excellent crop of alfalfa was growing on this plot. Local soils, even in the so-called "boron areas", seldom show over 3 parts per million.

L. V. Wilcox.

Prosser

During the week ending January 19 the lowest temperature was 3 degrees above zero. This is the coldest it has been during the winter.

Work at the station consisted of attending to office matters and routine feeding of farm stock.

A delegation of representatives from the Washington Irrigation Institute, appointed at the Ellensburg meeting last November, visited the station on January 17 for the purpose of investigating the scope and character of the work in progress here. The Institute desires to aid and cooperate in forwarding the work of the Experiment Station, and this visit was a first step in this cooperation. The members in attendance said that they were favorably impressed with the scope and value of the work being done.

C. C. Wright.

Rubidoux Laboratory

Under date of January 21 Mr. Frank M. Eaton reports as follows:

"The desired answers to a number of questions on boron injury and tolerance have promised to become most easily dislodged through the application of water culture methods. While waiting for the carpenters and plumbers to get the laboratory and greenhouse fixtures installed we had a very good opportunity to examine the literature and other sources of information for a suggestion of a nutrient solution which would prove most satisfactory for citrus seedlings. It seemed that the only culture solution which had been used extensively for citrus was one originally evolved for barley. Upon inquiry we found considerable difference of opinion as to its merits for citrus. It was criticized as being too concentrated with respect to certain salts and deficient with respect to others. The evidence also indicated that more alkaline solutions would be advantageous. A prescription was also found which included in small doses nearly everything from A to Z on the chemical shelf.

Rubidoux Laboratory (cont'd)

"By the time we should have started to work on boron we had concluded, with regrets, that first of all we would have to put boron up on the second shelf for a few days and go into the question of nutrient solutions rather seriously. This work involves the formulation of solutions with special merits and the comparison of these with solutions which have been used heretofore. Since some of these solutions must prove to be unsuitable, the work will give us an opportunity to study at first hand symptoms of malnutrition. This initial step may not in the end prove entirely disadvantageous for other reasons. When we see some lemon trees in the field we are not certain whether the symptoms are boron symptoms or something else. We may be told in a particular case that they are from high sulphates, and again near-good examples of boron injury are found where trees are within reach of neither excesses of boron nor sulphates but have been given only superphosphates. Possibly by the time we have practiced a little alchemy of our own in the way of good and poor lemon foods we can establish some first-hand ideas of symptoms which will prove to be valuable adjuncts to field observations. Our first experiments are then directed toward the evolution of the best possible nutrient solution for citrus under our conditions. In all seriousness it is a little difficult to measure boron injury in terms of plants which are suffering from other types of malnutrition.

"The program on culture solutions involves not only the trial of a number of solutions selected or formulated for special characteristics, but also includes repetitions at different acidities and seasons. The old idea that there are only ten essential elements has had such hard sledding in recent years that we are looking into the merits of an additional ten elements with a great deal of care. Of course we do not anticipate replacing the original ten, but it does appear that some other elements will have to be added to the list.

"Not long after we placed the boron bottle on the second shelf to get the foregoing started it was taken down again, and as a result we now have four first-class boron experiments under way. For example, there is one experiment, we call it the colony culture, which involves the comparison of the boron absorption rates and relative tolerances of Lima and navy beans, tomatoes, cabbages, beets, corn, barley, pumpkins, wheat, alfalfa, and lemons. These plants are grown together in the same vessels, each crop being mounted on separate jar lids; and these lids are then placed over holes in the various culture pans. The barley solution, previously referred to, is used as a nutrient, and the plants have done remarkably well. The alfalfa is almost ready for the first cutting; the Lima beans were knee high in three weeks; and the pumpkins are making flowers all over the tables. None of these plants appear to be injured by 3 parts per million of boron as yet, but all seem to be a trifle better at .75 parts per million. Blair is going to send these plants down to Wilcox shortly for analyses as a measure of the difference in their absorption rates. When this has been done we will start a new lot at 3, 9, and 27 parts per million of boron. Since we were a little surprised at the tolerance for 3 parts per million of boron, we are not committing ourselves as to what will happen at the 27 parts per million concentration this time.

Rubidoux Laboratory (cont'd)

"An outstanding fact with respect to boron injury to lemons is that trees watered with the same water show more severe injury on light than on heavy soils. Among the more tangible differences between light and heavy soils is the fact that the latter usually carry greater amounts of soluble silicates in solution than do the former. As one method of gaining information on the nature of this protection or tolerance in the heavier soils, we are adding successively larger amounts of sodium silicate to plants grown in culture solutions with varying amounts of boron.

"An interesting possibility in the nature of measures for counteracting boron toxicity was brought to our attention over at Santa Paula. A grower with a severely injured grove applied 10 pounds of calcium nitrate to each tree through one row of his grove. The row is reported to have greatly improved in appearance; but the following spring the calcium nitrate was applied uniformly over the whole block, which made further observations difficult. While we are inclined to credit the possibility that this may have been only an example of the stimulating effects of nitrates on a poorly fertilized grove, we have for this and other reasons set up an experiment in which the ratio of sodium and calcium are varied step by step in cultures with increasing amounts of boron. As a check we have a parallel experiment in which increasing amounts of calcium sulphate is added to cultures also with the same amounts of boron.

"Mr. Scofield has a special experiment under way in which increasing amounts of boron are added to lemon seedlings. This experiment, while designed to furnish a comparison of the rates of boron absorption and transpiration, has the added feature that it is proposed to account for, either in the used solutions or in the plants, all the boron that is added. When these plants have aged or died from too much or too little boron, they and the used solutions will be sent to Santa Paula for analysis."

San Antonio

Field work was possible only the first three work days of the week ending January 5, during which time one rotation plot and most of Field E-3 were plowed; the latter was also double disked as far as plowed. The location on Field F-3 for excavation experiments in connection with cotton rootrot remained too wet to handle, and this project suffered further delay.

An electrical and rain storm started about 10:30 a.m. January 4 and carried on through most of the night. The maximum temperature was 69 degrees F. (mean maximum 60.0), minimum 25 (mean minimum 35.6), and mean temperature for the week 47.8. The greatest daily range was 33 degrees. Precipitation occurred only on January 4 and amounted to .90 inch. Three days were recorded as clear, two partly cloudy, and two cloudy.

A small percentage of the flax seedlings in the Classification Nursery had just emerged at the time of the minimum temperature and were killed. It is now believed the stands were affected very little.

Geo. T. Ratliffe.

Scotts Bluff

The average maximum temperature for the week ending January 19 was 36, with a maximum of 51 on the 14th; the average minimum was 13, with a minimum of 1 on the 19th. No precipitation was recorded.

Work was continued on the calf barn when weather conditions would permit. Sixty tons of straw have been hauled and stored in the machine shed.

The following prices prevailed during the week: Alfalfa hay, $10 to $11 per ton; corn at elevator, $1.60 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 43 cents per pound; and eggs, 30 cents per dozen.

Both cattle and lambs are beginning to move from the feed lots to market. Cattle are not returning any great amount of profit; in fact heavy feeders which were bought during August, September, and October are showing a loss. Lambs are now showing a very good profit. Good lambs are bringing more than $16.50 per hundredweight on the Omaha market.

The following tables give the yields of oats, wheat, and alfalfa from the irrigated rotations in Field K and Field E.

Yield of Oats from the Irrigated Rotations in Field K - 1928

Rotation No.	Pounds per Plot Grain	Pounds per Plot Straw	Bushels per Acre
1	297	293	37.1
16	288	282	36.0
22	370	320	46.2
23	690	680	86.2
24	341	309	42.6
25	676	654	84.5
27	530	470	66.2
28	278	131	34.8
30	379	191	47.4
31	675	635	84.4
32	202	168	25.2
42	634	596	79.2
44	735	685	91.9
45	578	572	72.2
48	699	661	87.4
60	838	848	104.8
61	871	909	108.9
62	693	697	86.8
64	630	600	78.8
65	760	580	95.0
71	724	736	90.5
Average			70.8
Maximum			108.9
Range			83.7

Scotts Bluff (cont'd)

Showing the Effect of Manure and Alfalfa on the Yield of Oats in Field K - 1928

Item	No manure or alfalfa	Manured	Alfalfa or sweet clover
Number of plots	7	4	10
	Bushels per acre	Bushels per acre	Bushels per acre
Maximum	47.4	86.2	108.9
Minimum	25.2	66.2	72.2
Mean	38.5	80.3	90.6

Yield of Alfalfa from the Irrigated Rotations in Field K - 1928

Rotation No.	First plot	Second plot	Third plot	Total	Tons per Acre
	Pounds	Pounds	Pounds	Pounds	
8	1,320	980	830	3,130	6.26
40-1					
2	1,020	850	830	2,700	5.40
42-1					
2	960	920	1,020	2,900	5.80
44-1					
2	1,180	960	1,080	3,220	6.44
48-1					
2	680	720	830	2,230	4.46
60-1					
2	830	730	850	2,410	4.82
3	1,120	750	920	2,790	5.58
61-1					
2	1,220	990	1,060	3,270	6.54
3	1,290	920	1,120	3,330	6.66
62-1					
2	740	660	870	2,270	4.54
3	1,170	800	920	2,890	5.78
64-1	750	790	900	2,440	4.88
2	1,410	900	1,110	3,420	6.84
3	1,470	1,000	1,110	3,580	7.16
65-1					
2	1,260	1,170	1,040	3,470	6.94
71-1	920	700	770	2,390	4.78
2	1,280	760	970	3,010	6.02
3	1,230	820	830	2,880	5.76

Scotts Bluff (cont'd)

Yield of Wheat from the Irrigated Rotations in Field K - 1928

Rotation No.	Pounds per Plot Grain	Pounds per Plot Straw	Bushels per acre
3	239	491	15.9
5	299	431	20.0
7	234	466	15.6
18	302	558	20.1
28	264	476	13.0
48	380	890	25.3
Average	---	---	18.3

Yield of Oats from the Irrigated Rotations in Field E - 1928

Rotation No.	Pounds per Plot Grain	Pounds per Plot Straw	Bushels per Acre
13	558	532	69.8
15	691	589	86.4
17	634	886	79.2
19	598	402	74.8
33	480	660	60.0
41	626	534	77.0
43-A	727	663	90.9
43-C	648	512	81.0
46	486	474	60.8
47-A	704	776	88.0
47-C	657	603	82.1

James A. Holden.

Yuma

The maximum temperature for the week ending January 19 was 78, minimum 32, and greatest daily range 43. The precipitation was .14 of an inch.

A general storm throughout California and parts of Arizona resulted in a light rain on the night of January 16. A heavy inland or river fog occurred on the forenoon of January 17.

Station work performed during the week included a continuation of the cotton picking on the rotations; cutting, disking, and plowing under cotton stalks; disking and leveling the short lands on the A-13, 14, and 15 series; cleaning and repairing ditches and irrigation structures; pruning ornamentals; and general irrigating and cultivating.

The agricultural class of the Union High School at Yuma visited the station on January 15. As a part of a Valley Beautiful and Home Improvement campaign, the class made cuttings of all the station ornamentals that could be propagated in this manner.

E. G. Noble.

W E E K L Y R E P O R T S
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Belle Fourche

The following is an abstract of Mr. Aune's report on the sheep investigations conducted at the field station from October 1, 1927 to October 1, 1928:

When the investigation began on October 1, 1927, there were in the entire flock 117 head, of which 43 were purebred Hampshires and 74 were grades. The bucks were turned in with the ewes on October 3, 1927, and were taken out on November 7.

Feed.- During the breeding period the ewes were on good third cutting alfalfa. During November and the early part of the winter they had the range of the entire farm and were fed as much first cutting alfalfa hay as they would clean up. In the latter part of January they were fed a grain mixture of ground barley and whole oats, starting with a half pound per head. This was increased until when lambing commenced, in the latter part of February, they were getting one pound per head. This ration was continued until they were placed on pasture in May.

Lambing results.- A total of 94 ewes were originally turned in with the bucks. Of the 94 ewes bred, 82 lambed, 3 died before lambing, 3 died during lambing, and 3 died after lambing. One hundred and sixty lambs were born--68 bucks and 92 ewes. On June first 140 lambs were living--60 bucks and 80 ewes.

Wool.- The sheep were sheared on May 21. The average weight per head of the fleeces was 10.80 pounds.

Comparison of native pasture, alfalfa, and sweet clover.- On May 24, 1928, 6 ewes and 10 lambs were turned into a native pasture containing 13 acres. The lambs were pastured for 83 days and made an average daily gain of .302 pound [illegible], their final average weight on August 16 being 90 pounds. The 6 ewes were pastured for 144 days and made an average daily gain of .111 pound. Each ewe and her lambs required 2.1 acres of native pasture. The lambs made gains at the rate of 20 pounds per acre.

On May 24 two ewes and three lambs were turned into one-fourth acre of alfalfa. The lambs were pastured 75 days and made an average daily gain of .333 pound, which was at the rate of 300 pounds per acre. The ewes were pastured for 119 days and made a gain of 80 pounds per acre. The carrying capacity was at the rate of 8 ewes and 12 lambs per acre.

On May 24 five ewes and eight lambs were turned into .64 acre of sweet clover pasture. The lambs were pastured for 69 days and made an average daily gain of .299 pound per acre. The ewes were pastured for 119 days and made a gain of 19 pounds per acre. The carrying capacity on sweet clover was at the rate of 12 lambs and 8 ewes per acre.

Harvesting corn and beet tops with lambs in Rotations 47 and 71.- On September 28 45 lambs, with an average weight of 64.7 pounds, were turned into Rotations 47 and 71, which were estimated to yield 56.7 bushels of corn per acre. In addition to the corn, alfalfa hay was fed at the rate of 3,806 pounds per acre, and beet tops were fed from plots of the same size in the same rotations. When the lambs were removed from

Belle Fourche (cont'd)

the plots on November 8 they had gained during the period of 41 days 790 pounds, which was an individual gain of 17.55 pounds or an average daily gain of .43 pound. The corn consumed per pound of gain was 3.08 pounds. Computing the results on an acre basis, the lambs gained 1,234 pounds. At 7 cents per pound this would mean $86.38 for the corn, from which would be deducted 3,806 pounds of alfalfa hay at $8.00 per ton or $15.22, and $6.00 for one acre of beet tops, leaving a net return per acre of $65.16. As the corn was estimated to yield 56.7 bushels per acre, the returns from the sale of lambs paid for it at the rate of $1.15 per bushel. The market price of lambs at this time was 12 cents per pound, which paid $126.86 per acre, or $2.24 per bushel, for the corn. The following table shows the results from the two rotations containing .64 acre:

Rotation No.	Number of lambs	Initial wt. 9/28	Wt. 10/11	Gains in 13 days	Wt. 10/25	Gains in 14 days	Wt. 11/8	Gains in 14 days	Total gains in 41 days
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
71	15	909	1,039	130	1,140	101	1,222	82	313
47	30	2,002	2,203	201	2,264	61	2,479	215	477

Summary of Results Combined

		Sept. 28 to Nov. 8
Dates of test		41 days
Number of lambs per .64 acre of corn		45
Live weight when turned into corn		2,911 lbs.
Final weight when taken out		3,701 "
Total gains for .64 acre of corn		790 "
Total gains per acre		1,234 "
Average daily gain per lamb in 41 days		.43 lb.
Estimated yield of corn per acre		56.7 bu.
Estimated amount of corn consumed per pound of gain		2.59 lbs.
Amount of alfalfa hay consumed per pound of gain		3.08 "
Returns per acre from lambs at 7 cents per pound		$86.38
Less 3,806 pounds alfalfa hay at $8.00 per ton	$15.22	
Less one acre of beet tops at $6.00 per acre	6.00	$21.22
Returns per acre of corn		$65.16
Price that returns from lambs paid for corn per bushel		$1.15

Summary of results.- The sheep consumed 121,840 pounds of alfalfa hay, which was at the rate of 6.5 pounds each per day. The ewes were fed grain from the latter part of January until they were turned on pasture in May. All the lambs had access to grain in creep until they were placed on pasture. The purebred lambs had access to grain in creep during the pasture period. The total amount of grain consumed was 14,320 pounds. In computing the feed costs, alfalfa was valued at $10 per ton; oats, corn, or barley, as used, at $1.50 per hundredweight; sweet clover pasture and alfalfa pasture at $20 per acre; and other pasture not irrigated at $2 per acre.

Belle Fourche (cont'd)

The following statement shows the actual sales that were made and the possible sales that could have been made during the year, also the cost of feed and the net return per head:

Wool from 110 sheep, 1188 pounds at 36¢	$427.68
67 lambs sold Aug. 16, total weight 5210 pounds, at 10½¢	547.05
21 buck lambs sold at auction sales Sept. 17	783.50
18 ewe lambs on hand Sept. 30, valued at $25 each	450.00
1 Hampshire buck on hand Sept. 30, valued at $50	50.00
27 Grade lambs on hand Sept. 30, total weight 2424 pounds, at 10½¢	254.53
Total actual and possible sales	$2,512.75
Average return per head	22.84

121,840 pounds of alfalfa hay at $10 per ton	$609.20	
14,320 " of grain at $1.50 per cwt.	214.80	
10 acres sweet clover pasture at $20 per acre	200.00	
24 acres of other pasture at $2 per acre	48.00	
Total value of feed	$1,072.00	
Total feed cost per head	9.75	9.75
Net return per head		$13.09

On October 1, 1928, there were in the entire flock a total of 153 head, of which 59 were purebred Hampshires and 94 were grades.

Prosser

The coldest weather this winter occurred during the week ending February 2. On January 30 the minimum temperature was -10, which is the lowest recorded at the station this winter. About six inches of snow is on the ground.

Conductance work in the laboratory was continued during the week. A number of alkali soils were tested, and some of them show a Ks of more than 1000. Wherever samples of a soil profile have been obtained in alkali areas, the surface sample seems to contain the most salt.

A series of poultry extension meetings, conducted by the County Agent and college extension specialists, were held in the valley during the week. A two-day school was called at Prosser. The increased attendance over last year indicated the growing interest in this industry in the lower valley. Brooding problems and brooding equipment were stressed among other things at the Prosser session. A movement was also started to get the poultrymen of the Prosser district to organize either into an independent association or to affiliate with Yakima or Spokane associations, which are both going concerns at the present time.

C. C. Wright.

Scotts Bluff

The average maximum temperature for the week ending January 26 was 21, with a maximum of 40 on the 22d; the average minimum was 3 below zero, with a minimum of 18 below zero on the 25th. Precipitation was .06 on the 24th. This is by far the coldest week we have had this winter.

Scotts Bluff (cont'd)

The following prices prevailed during the week: Alfalfa hay, $10 to $11 per ton; corn at elevator, $1.72 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 44 cents per pound; and eggs, 27 cents per dozen.

The station entered one pen of chickens and one pen of turkeys in the poultry show held at Henry, Nebraska, this week. Entries were made from Bridgeport, Nebraska, on the east to Wheatland, Wyoming, on the west. There were a large number of entries and the competition was keen. The station received first in White Leghorn cockerels, third in White Leghorn pullets, and second in turkey hens.

On Wednesday the superintendent attended a meeting of the North Platte Valley Lamb Feeders' Association at Scottsbluff and took part in the program. The object of this association, which is a local of the Colorado-Nebraska Lamb Feeders' Association, is to permit orderly marketing and to stimulate consumption of mutton. Each member is taxed 1 cent per lamb for all lambs shipped to market, where the 1 cent is collected by the commission company. About 100 per cent of the feeders are members. It is felt that a great deal of good is being accomplished.

The top price for lambs at Omaha is about $16.75 per hundred, which is returning the feeder a very good profit.

The first few days of this week the price of hogs at Omaha advanced to $9.95 per hundred. Later in the week some of this advance was taken off.

Most of the cattle that are going to market now are bringing little more than they cost as feeders and in some cases less.

Results from winter feeding and summer pasturing steer calves at the Field Station 1927-28

Item	Lot 1	Lot 2*	Lot 3	Lot 4	Lot 5
Number of steers in each lot ...	17	18	18	18	18
Initial weight Dec. 3, 1927, lbs.	5,870	6,070	6,070	6,110	6,100
Spring weight May 18, 1928 "	6,895	8,975	8,625	8,305	8,785
Final weight Oct. 20, 1928 "	10,032	11,809	11,758	11,696	11,832
Gains during winter ..... lbs.	1,025	2,905	2,555	2,195	2,685
Gains during summer ..... "	3,137	2,834	3,133	3,391	3,047
Total gains for the two periods	4,162	5,739	5,688	5,586	5,732
Gains per calf first period, lbs.	60	161	142	122	149
Gains per calf second period "	185	158	174	188	169
Total gains per calf ....."	245	319	316	310	318
Feed consumed-					
Alfalfa, tons	16.63	11.45	16.64	12.22	---
Corn silage, tons	--	--	--	18.82	37.63
Dry beet pulp, " ...	--	--	2.99	--	--
Cottonseed cake, lbs.	828	--	--	--	2,146
Winter feed cost per lot	$126.11	$119.23	$162.17	$154.71	$197.19
Winter feed cost per calf	7.42	6.62	9.00	8.59	10.95
Summer pasture 5 months at 75¢ per head per month	63.75	67.50	67.50	67.50	67.50

*Lot 2 was fed tops from 112 tons of beets. (Table cont'd on next page)

Scotts Bluff (cont'd)

Table continued from preceding page

Item	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Total feed cost per lot	$189.86	$186.73	$229.67	$222.21	$264.69
Total feed cost per calf	11.17	10.37	12.76	12.35	14.71
.....					
Initial cost of calf	40.00	40.00	40.00	40.00	40.00
Cost of feed per calf	11.17	10.37	12.76	12.35	14.7.
Interest on investment	3.64	3.61	3.71	3.69	3.7.
Total cost per calf	$54.81	$53.98	$56.47	$56.04	$58.50
lbs.					
Average final weight per calf /..	590	656	653	650	657
Appraised value per cwt.	$10.50	$11.00	$11.00	$11.00	$11.00
Value of calf	61.95	72.16	71.83	71.50	72.27
Net profit per calf	7.14	18.18	15.36	15.46	13.77

Daily winter ration per calf

Lot 1 - Alfalfa hay, one-third pound cottonseed cake..
Lot 2 - Alfalfa hay, beet tops.
Lot 3 - Alfalfa hay, 2 pounds of dry pulp.
Lot 4 - Alfalfa hay, 13½ pounds corn silage.
Lot 5 - 27 pounds corn silage, three-fourths pound cottonseed cake.

The average maximum temperature for the week ending February 2 was 23, with a maximum of 37 on the 2d; the average minimum temperature was 4 below zero, with a minimum of 10 below on January 27. No precipitation was recorded. The weather continued cloudy and very cold until this morning, February 2--Groundhog Day--when it cleared up and was almost like spring. The groundhog sure saw his shadow.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.75 per hundredweight; barley at elevator, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 46 cents per pound; and eggs, 30 cents per dozen.

The annual meeting of the Pathfinder Irrigation District was held during the week. The report shows that the District is in a good financial condition. The Scottsbluff Star-Herald in reporting the meeting says: "A report submitted by James T. Whitehead, of Mitchell, brought some illuminating facts and figures on the large power plant at Guernsey. Mr. Whitehead stated that the net earnings of the plant in the past year were, in round numbers, $180,000, $55,000 of which was set aside for a reserve fund.

"The average cost of generating per kilowatt hour was reported as .53 of a cent, while the selling price was 1.22 cents per kilowatt hour. A total of 18,900,000 kilowatt hours was sold in the year.

"Taking into consideration the low prices of farm products, the crop report for the district was encouraging. It has shown that the crop return for the district averaged slightly above $26.00 per acre, which is something like $3.00 per acre less than the 10-year average. As an example of low prices, it was quoted that potatoes were taken, in compiling the average, at 13 cents per bushel."

James A. Holden.

Yuma

The maximum temperature for the week ending January 26 was 68, minimum 20, greatest daily range 37. No precipitation was recorded.

From January 23 to 26, inclusive, the minimum temperatures were 24, 25, 30, 20, and 20, respectively. This unusually cold weather has frosted many subtropical trees and ornamentals. This is the lowest minimum temperature recorded at the station since 1923.

Cotton continues to show up at the gins. A total of 27,690 bales have been ginned to date. Much of the cotton coming in now is "bolly" or "pulled." Some growers are having trouble getting pickers.

Station work performed during the week included the plowing of grain sorghum and cotton stubble plots in the rotations; removing tamarisk trees from plot C-29; cutting, hauling, and sawing wood; pruning and making cuttings of grapes, pomegranates, and various ornamental shrubs; and general irrigating and cultivating.

Mr. C. S. Scofield was a station visitor January 24.

Cotton yields for 1928 with a comparison of results secured in previous years are given in the following table.

A summary of seed cotton yields in the irrigated rotations at the Field Station, 1923 to 1928, inclusive.

Rotation No.	Yields of seed cotton per acre							Rank
	1923	1924	1925	1926	1927	1928	Average	
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	
4	764	784	1,272	1,674	1,038	1,272	1,134	15
5	1,252	956	2,552	2,428	1,722	1,804	1,786	2
6	728	800	996	1,470	734	1,188	986	17
7	744	600	1,016	1,440	778	1,124	933	19
20	644	824	1,964	1,278	1,586	720	1,169	12
22	636	592	1,144	1,076	850	668	828	20
23	844	1,052	1,416	1,900	1,172	1,188	1,258	10
30	456	280	1,032	1,044	664	988	744	21
40*	884	784	2,596	2,758	1,146	872	1,507	5
40	772	520	852	2,359	1,504	944	1,158	14
44*	1,008	2,136	1,848	1,979	1,624	2,136	1,788	1
44	980	984	2,268	1,624	1,056	1,044	1,326	9
46	1,244	1,144	1,104	1,992	1,614	1,260	1,393	6
50	728	672	1,116	1,460	840	1,192	1,001	16
52	684	808	2,680	1,846	922	1,100	1,340	8
60*	688	904	1,100	1,717	1,466	1,164	1,173	12
60	420	600	948	1,554	842	1,424	964	18
61*	672	832	1,632	2,044	2,026	1,876	1,513	4
61	792	708	984	1,462	1,160	1,940	1,174	11
63*	1,064	1,948	1,660	2,490	1,864	1,584	1,768	3
63	732	1,072	1,620	1,790	1,280	1,620	1,352	7
Max.	1,252	2,136	2,680	2,758	2,026	2,136	2,164	---
Min.	420	280	852	1,044	664	668	654	---
Avg.	797	904	1,514	1,780	1,233	1,291	1,253	---

*Where the same number appears twice, first number means first year in that crop.

Yuma (cont'd)

New rotations started in 1928

Rotation No.	Yield seed cotton per acre Pounds
7-A	2,348
7-B	2,076
31	1,828
34	2,312
34	2,356
36	2,348
36	2,488
54	2,520
54	2,584
56	2,396
64	2,348
64	2,048
64	2,092
65	2,392
65	2,160
Maximum	2,584
Minimum	1,828
Average	2,286

E. G. Noble.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI | February 9-23, 1929 | No. 4

Limoneira Laboratory

Report for week ending February 9.

The routine work in the laboratory continues about as usual. In addition to receiving 13 weekly samples, quite a number of miscellaneous samples come in from time to time. We have completed the work on 630 water samples since the laboratory was started last July.

We have also completed the boron determinations on about 120 leaf samples that we have on hand. Some of the results, which would no doubt be of general interest, follow:

Parts per million of boron in the dry matter of alfalfa

From	p.p.m. Boron	Injury
Fallon, Nevada	168	None
Santa Maria, Calif.	85	None
Sespe Ave.	152	None

Parts per million of boron in the dry matter of lemon leaves

From	p.p.m. Boron	Injury
Santa Maria, Calif.	95	None
Sespe Ave.	840	Very severe
San Fernando city	147	None

Parts per million of boron in the dry matter of walnut leaves

From	p.p.m. Boron	Injury
Santa Maria, Calif.	177	None
Sespe Ave.	1088	Very severe
San Fernando city	170	None.

L. V. Wilcox.

Newlands

The following meteorological data were recorded at this station during the three-week period ending February 23: Mean maximum 46.8, maximum 63 on the 22d; mean minimum 17.1, minimum 1 on the 9th. There was .05 inch of rain on the 1st, .07 on the 2d, .33 on the 3d, .01 on the 4th and 6th, and .06 on the 23d, making a total of .53 inch for the period.

The moderate temperatures during the last ten days have thawed the ground fairly well, making it possible to start some of the early spring work.

Two men have been busy hauling manure from the dairy corrals to various plots about the farm. The use of this manure has had a decidedly beneficial effect on the sandy areas. It is estimated that some 300 to 350 tons of manure are used on the farm every spring. At the present time this manure is being spread on B-2, 3, and 4 and C-1 to 13, inclusive. The orchard and other areas will be given similar treatments.

Newlands (cont'd)

The State is having new corrals built for the dairy calves, and has already replaced the wire fences about the various pens for dairy cows with board fences. These are to be whitewashed next week, and they will then present a neat appearance.

The experiment being conducted with dairy cows is producing some interesting data. Mr. F. B. Headley, who has charge of this work for the State, visits the station every month, at which time future plans are evolved and past records are compiled.

A particularly interesting piece of work undertaken at this station is a survey of the underground water of the entire farm, particular emphasis being placed on the amount of boron salts present in the underground water as well as the sodium, calcium, and magnesium salts in solution. Wells are being driven at stated distances over the farm's area and samples of the soil profile gathered from the surface to the water-table. About 5-pound samples are taken of each change in soil during the drilling process. Two gallon samples of the water encountered are gathered. Each water level is referenced to sea level. Thirteen samples of water have been analyzed to date.

E. W. Knight.

Prosser

Laboratory work during the week ending February 16 included conductance determinations on a number of water samples which have accumulated during the past season. A large number of these samples represent drainage water from the Wapato Project. None of them show a higher conductance than many streams of irrigation water. It is planned to use these conductance determinations as a basis for computing the annual quantity of soluble material carried off by the drainage of the Wapato system. In another month, weekly samples throughout a year's time will be available.

The conductances of this drainage water and of some miscellaneous water samples are given in the following table. It will be noticed that the samples from the Sunnyside Canal, which represent the Yakima River in general, show a conductance equivalent to less than 100 parts per million, which is in conformity with most other analyses that have been made of water from this river.

Prosser (cont'd)

Conductance of water samples collected during 1928
(Conductance expressed as K x 10-5)

Location	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.
Sunnyside Canal ...	---	12.4	9.5*	11.9*	11.8	11.2	12.0	---	---
Main drain of Wapato Project	49.6	39.5*	36.4*	35.1*	34.3*	36.5*	35.7*	33.2*	---
Irrigation water from Yelm irrigation project				---	---	7.3	---	---	---
Yelm spring water				---	---	10.2	---	---	---
Yelm drainage water				---	---	13.2	---	---	---
Irrigation water from Sequim irrigation project				---	---	14.6	---	---	---
Sequim natural drainage water No. 1				---	---	20.0	---	---	---
Sequim natural drainage water No. 2				---	---	22.7	---	---	---
Pacific Ocean water at Edmonds, Wn.				---	---	4800	---	---	---
Drainage water from Prosser Experiment Farm				---	---	---	---	144	150
Artesian water from Cold Creek				33.0					

*Average for month.

No field work has yet opened up in the valley. Snow to a depth of about 7 inches is still on the ground, and the temperature is unusually cold.

Sheep men in the valley are experiencing great difficulties on account of the severe weather. February is the customary month for lambing in this country, and it is usually a pleasant time of the year in this region. But this year the temperature has been continuously below freezing during the first half of the month, and the losses have been much heavier than usual.

C. C. Wright.

San Antonio

Report for the period January 6 to February 23.

The following meteorological data were recorded during this period: Maximum temperature 82 on January 24. This is also the maximum for January. The minimum temperature of the winter to date occurred on February 11 when 20° F. was recorded. The mean temperature for January was 51.9, which is almost exactly the average temperature for January during the past 22 years. The mean temperatures for February have been subnormal to date with unusually long periods of cold weather. Precipitation during January was 1.35 inches as compared with 1.11 inches for the past 22 years. This was sufficient for crop needs at that time, but only .07 of an inch of rain has fallen to date in February; and if there is no rain within a week or ten days, it will be necessary to plant corn and sorghums in a dry seedbed. Cloudy weather has been quite common during the period with only ten clear days in January and five clear days to date in February. Evaporation during January was 2.46 inches as compared with 2.40 inches average for the month for the past 22 years. Evaporation during February has been below normal.

San Antonio (cont'd)

The normal temperatures during the last two weeks of January forced some apricots, plums, and peaches into bloom, and caused rapid growth of the small grains in the field. This was followed by low temperatures the first two weeks in February and freezes on February 9, 10, and 11, minimum temperature 24, 21, and 20° F., respectively. These temperatures no doubt killed flower buds which had opened. The tips of the leaves of small grains were frozen and growth was checked. Field peas were also frozen back, but the plants were not killed. Flax stands in the variety test and in the flax classification nursery were injured. The injury to the stands in the nursery amounted to as high as 90 per cent in some cases.

The following is a summary of the climatological data recorded during this period.

Week ending	Temperature (degrees F.)					G. D. R.	Precipitation	Sky (days)		
	Maximum		Minimum		MEAN			Clear	Partly cloudy	Cloudy
	Absolute	Mean	Absolute	Mean						
							Inches			
Jan. 12	71	60.4	29	37.1	48.8	35	.37	3	3	1
" 19	77	68.3	38	44.7	56.5	35	.07	2	0	5
" 26	82	65.6	28	42.3	53.9	54	.01	0	2	5
Feb. 2	73	59.1	33	37.6	48.4	36	.08	2	1	4
Month of Jan.	82	63.9	25	39.8	51.9	54	1.35	10	8	13
Feb. 9	74	53.1	21	34.1	43.6	32	--	0	3	4
" 16	78	60.3	20	33.1	46.7	46	--	3	2	2
" 23	79	67.3	32	38.9	53.1	37	.07	2	3	2

Field work has been possible most of the time during the period. Part of field C-6 was manured and the entire field plowed in preparation for rootrot experiments in cooperation with Dr. D. C. Neal, Office of Cotton, Rubber, and Other Tropical Plants, Greenville, Texas, and Mr. Paul Dawson, Bureau of Chemistry and Soils, Austin, Texas. Plowing of B-4, rotation plots and green manure plots, scheduled for February, and spring plowing of part of field ABC-7 were completed. The tonnage of green manure on the field pea plots was much greater than usual and from samples taken was calculated to be from 3.7 to 8.25 tons per acre on the various plots. Preparation of the seedbed for corn and sorghums was started. The last planting, in the time-of-planting flax test, was made February 23. Field E-3 and the waste land between E-3 and D-4 were prepared and planted to alfalfa, but only a small percentage of a stand has been secured as yet. This field is badly in need of moisture. Work in the orchards has consisted of replanting all vacant positions with plants secured from the Office of Foreign Plant Introduction, replanting and resurveying Nursery A-1, tree pruning, and removing trees in Orchard A-1 along the road to make room for an ornamental planting. Work of excavating, constructing barriers, and treating the soil in an experiment attempting to control cotton rootrot on ornamentals and fruit trees was completed. Other work at the station has consisted of miscellaneous repair of buildings and machinery, repair of farm residence driveway, and work on the grounds.

San Antonio (cont'd)

Visitors during the period were:
January 19 - Mr. R. B. Streets, Plant Pathologist, University of Arizona.
" 30 - Mr. Paul R. Dawson, Associate Biochemist, Bureau of Chemistry and Soils, Austin, Texas.
February 7 - Dr. D. C. Neal, Senior Pathologist, Office of Cotton, Rubber, and Other Tropical Plants, Greenville, Texas.

I. M. Atkins.

Scotts Bluff

The average maximum temperature for the week ending February 9 was 25, with a maximum of 52 on the 3d; the average minimum temperature was 2 below zero, with a minimum of 19 below on the 8th. The precipitation was .07 inch.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.73 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 47 cents per pound; and eggs, 30 cents per dozen.

During the week one of the dairy cows and a calf from the feeding lots died. The veterinarian said they had hemorrhagic septicemia. The cows and the calves were vaccinated, and at the same time the calves were vaccinated for blackleg.

The average maximum temperature for the week ending February 16 was 29, with a maximum of 35 on the 12th; the average minimum temperature was 1, with a minimum of 8 below zero on the 10th.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.73 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 47 cents per pound; eggs, 32 cents per dozen.

The price of cattle is still going down, while the price of hogs is going up. The price of lambs remains about the same.

The average minimum temperature for the week ending February 23 was 1 below zero, with a minimum of 18 below zero on the 19th. The precipitation was .05 inch. The maximum thermometer is broken, therefore we cannot give a maximum report.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.75 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 50 cents per pound; and eggs, 35 cents per dozen.

Cattle showed a little strength in prices, but are still far too cheap to make any profit. The price of lambs was about 50 cents lower during the first part of the week, but on Friday this loss was more than regained when tops at Omaha brought $16.75. Hog prices are still going up.

James A. Holden.

Yuma

The maximum temperature for the two-week period ending February 9 was 75, minimum 29, and the greatest daily range 43. There was a trace of precipitation.

A general storm on the coast and in northern Arizona produced but a trace of rain locally. This was recorded on the 1st, 6th, and 7th. A cold wind from the north has kept the temperatures below normal for this season of the year.

"Bolly" and "pulled" cotton is still coming in to the gins at the rate of about 500 bales a week. The total number of bales ginned to date on the project is 30,045. Ginning will be completed in about two more weeks. Present local prices for the late and low grade cotton are around 14 cents per pound.

Station work performed during the week included plowing, disking, and leveling of plots to be planted to cotton in the rotations; digging out excess tamarisk and cottonwood trees; and cleaning ditches and repairing irrigation structures.

Mr. O. F. Cook and party were station visitors January 31 and February 1.

The maximum temperature for the two-week period ending February 23 was 92, minimum 27.5, and greatest daily range 46. No precipitation was recorded. The weather for the most part has been cloudy, cool, and windy during this period. The spring growth on trees and ornamentals is later than normal.

The cotton harvesting season of 1928 is being prolonged; several project gins are still in operation. The total number of bales ginned to date is 31,224. This is the largest production in the history of the project. Only three of the sixteen gins have closed down for the season.

Planting the new crop of cotton has started in the Yuma Valley. In those sections where the soil is light and ridging is practiced, early plantings are usually made.

Station work performed during this period included the leveling of plots to be planted to cotton; releveling nursery plots; pruning date palms; removing old cottonwood trees and tamarisk windbreak; cleaning and repairing ditches; and general hoeing and cultivating.

Mr. Roland McKee, of the Office of Forage Crops, was a station visitor on February 11 and 12.

E. G. Noble.

W E E K L Y R E P O R T S
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Belle Fourche

The following is a report of the lamb-feeding experiments on the field station in 1928-29:

The lamb-feeding experiments here reported were conducted in cooperation with the South Dakota State College of Agriculture to determine the feeding value of home grown feeds and by-products of the sugar beet industry, and to find out how these and such other feeds as may be shipped in can be combined to yield the most profitable return. For this purpose 350 range lambs were bought at 12 cents a pound. They were divided into 14 lots of 25 lambs each and were fed the following rations:

Lot 1. Dry pulp and alfalfa hay.
" 2. Dry pulp 5 parts, cottonseed cake 1 part, and alfalfa hay.
" 3. Barley and alfalfa hay.
" 4. Oats and alfalfa hay.
" 5. Corn and alfalfa hay.
" 6. Pressed pulp, cottonseed cake, and alfalfa hay.
" 7. Pressed pulp and alfalfa hay.
" 8. Pressed pulp, molasses, and alfalfa hay.
" 9. Pressed pulp 60 days, barley, finished with barley, cottonseed cake, and alfalfa.
" 10. Barley 5 parts, cottonseed cake 1 part, and alfalfa hay.
" 11. Corn 5 parts, cottonseed cake 1 part, and alfalfa hay.
" 12. Corn 5 parts, linseed cake 1 part, and alfalfa hay.
" 13. Dry pulp 2½ parts, barley 2½ parts, cottonseed cake 1 part, and alfalfa hay.
" 14. Dry pulp 5 parts, linseed cake 1 part, and alfalfa hay.

The same rations will be continued for a three-year period; so the results this season should not be taken as final, but they may serve as an indication of what may be expected where similar feeds or rations are used.

The test was started October 13 and continued until February 18, a total of 128 days. All the lots were fed through panels twice a day as much good alfalfa hay as they would clean up. The beet pulp and molasses were fed in separate yards morning and evening. All the lots had access to water at all times through automatic waterers, and salt was available in boxes in each pen. The ration of grain and dry pulp, starting at one-fourth pound per day, was gradually increased until 1-3/4 pounds per day was being fed at the end of the feeding period. Three-fourths of a pound was all they would consume for the first 60 days. The first and second cutting alfalfa hay was of excellent quality, which may account to some extent for the long period required to get the lambs on full feed.

The lots fed pressed pulp were started with 1 pound per day, which was gradually increased to 3½ pounds. This was all they would consume for the first 30 days. After this period the pressed pulp was gradually increased until by the end of the feeding period they consumed each day from 5 to 6 pounds per head.

Belle Fourche (cont'd)

Lot 8 was fed pressed pulp, molasses, and alfalfa hay. Starting with one-fourth pound per head per day, the molasses were increased to one-half pound in 30 days and were fed at that rate for the rest of the feeding period.

Lot 9 was fed pressed pulp alone and alfalfa hay for the first 60 days. This ration was gradually changed to one of barley and cottonseed cake for the rest of the period.

On February 22 all the lambs were shipped to Sioux City. They were loaded at Newell at 5:30 a.m. Friday and arrived at Sioux City at 5:30 p.m. Saturday. They were sold on Monday's market to the Cudahy Packing Company for $16.25 per hundred, which was the top of the market for that day. They were afterwards divided into lots as fed and appraised according to the quality of the finish. The lots receiving pulp alone and alfalfa were appraised at $16.00; and the lots receiving barley and corn, supplemented with cottonseed cake or linseed cake, were appraised at $16.10 to $16.50. Lot 11, receiving corn and cottonseed cake, was judged to have the best finish of all the lots.

To determine the shrinkage between the feedlot and Sioux City, the lambs were weighed in the morning before they were fed and again in the afternoon after they were taken to the Newell stock yards. There was a shrinkage of nearly two pounds per head between the farm and the Newell yards. The total shrinkage per head between the feedlot and Sioux City varied from 5.62 pounds in lot 4 to 8.26 pounds in lot 11. The average shrinkage for all lots was 6.9 pounds.

The freight and marketing charge, using double deck cars, amounted to 65 cents per lamb, not taking the shrinkage into consideration. The cause of the feedlot death loss, amounting to 2.3 per cent, is not known; it could not be attributed to any particular feed.

The following table summarizes in detail the results thus far obtained in these experiments.

Belle Fourche (cont'd)

Item	Dry pulp, alfalfa	Dry pulp, cotton-seed cake, alfalfa	Barley, alfalfa	Oats, alfalfa	Corn, alfalfa	Pressed pulp, cotton-seed cake, alfalfa	Pressed pulp, alfalfa
Lot No.	1	2	3	4	5	6	7
Number of lambs in lot	25	25	25	25	25	25	25
Initial weight(av.)lbs	55.40	55.28	55.40	55.40	54.96	55.00	55.16
Final weight (av.) "	86.12	93.52	92.48	89.48	96.88	89.20	83.76
Gain per lamb "	30.72	38.24	37.08	34.08	41.72	34.20	28.60
Feed required per 100 pounds of gain:-							
Dry pulp lbs.	389	293	---	---	---	---	---
Pressed pulp "	---	---	---	---	---	2,000	2,392
Cottonseed cake "	---	58	---	---	---	64	---
Linseed cake "	---	---	---	---	---	---	---
Barley "	---	---	375	---	---	---	---
Oats "	---	---	---	395	----	---	---
Corn "	---	---	---	---	310	---	---
Molasses "	---	---	---	---	---	---	---
Alfalfa "	965	840	885	967	806	1,005	1,276
Feed cost per 100 pounds gain $	8.91	8.73	10.05	10.76	9.30	9.12	9.37
Initial cost of lamb $	6.65	6.63	6.65	6.65	6.60	6.60	6.62
Feed cost per lamb $	2.74	3.34	3.73	3.67	3.88	3.12	2.68
Interest $	.20	.20	.20	.20	.20	.20	.20
Freight & marketing $	.65	.65	.65	.65	.65	.65	.65
Total cost per lamb $	10.24	10.82	11.23	11.17	11.33	10.57	10.15
Final weight at feed yard (av.) lbs.	86.12	93.52	92.48	89.48	96.68	89.20	83.76
Shrinkage to Sioux City (av.) lbs.	6.14	8.54	7.08	5.62	7.95	7.92	6.52
Selling weight "	79.98	84.98	85.40	83.86	88.73	81.28	77.24
Selling price per cwt. $	16.00	16.10	16.25	16.25	16.40	16.25	16.00
Receipts per lamb $	12.80	13.68	13.88	13.63	14.55	13.21	12.36
Profit per lamb $	2.56	2.86	2.65	2.46	3.22	2.64	2.21
Dressing weight(av.)lbs	38.00	40.00	40.00	39.00	43.00	40.00	35.00
Dressing weight %	45.93	47.13	46.65	46.11	48.31	48.33	45.11

The above feed costs are based on the following prices: Corn $1.70 per cwt., oats $1.50 per cwt., barley $1.50 per cwt., dry pulp $1.05 per cwt., pressed pulp $2.50 per ton, cottonseed cake $2.50 per cwt., linseed cake $3.15 per cwt., molasses 75 cents per cwt, and alfalfa hay $10.00 per ton. The original cost of the lambs was 12 cents per pound.

(Table cont'd on next page)

Belle Fourche (cont'd)

(Table cont'd from preceding page)

Item	Pressed pulp, molasses, alfalfa	Pressed pulp 1st 60 days, barley, cottonseed cake, alfalfa	Barley, cottonseed cake, alfalfa	Corn, cottonseed cake, alfalfa	Corn, linseed cake, alfalfa	Dry pulp, barley, cottonseed cake, alfalfa	Dry pulp, linseed cake, alfalfa
Lot No.	8	9	10	11	12	13	14
Number of lambs in lot	25	25	25	25	25	25	25
Initial weight (av.) lbs.	55.40	55.32	55.04	55.04	55.40	55.28	55.52
Final weight (av.) "	80.28	86.32	94.80	98.32	92.88	95.60	93.40
Gain per lamb "	24.88	31.00	39.76	43.28	37.48	40.32	37.88
Feed required per 100 pounds of gain:-							
Dry pulp lbs.	---	---	---	---	---	140	292
Pressed pulp "	2,509	900	---	---	---	---	---
Cottonseed cake "	---	42	58	52	---	56	---
Linseed cake "	---	---	---	---	56	---	58
Barley "	---	209	290	---	---	140	---
Oats "	---	---	---	---	---	---	---
Corn "	---	---	---	260	281	---	---
Molasses "	243	---	---	---	---	---	---
Alfalfa "	1169	890	931	792	880	884	929
Feed cost per 100 pounds gain $	10.81	9.76	10.46	9.68	10.94	9.39	9.54
Initial cost of lamb $	6.65	6.64	6.60	6.60	6.65	6.63	6.66
Feed cost per lamb $	2.69	3.03	4.16	4.19	4.10	3.79	3.61
Interest $	.20	.20	.20	.20	.20	.20	.20
Freight & marketing $	.65	.65	.65	.65	.65	.65	.65
Total cost per lamb $	10.19	10.52	11.61	11.64	11.60	11.27	11.12
Final weight at feed yard (av.) lbs.	80.28	86.32	94.80	98.32	92.88	95.60	93.40
Shrinkage to Sioux City (av.) lbs.	5.75	5.65	7.71	8.26	7.38	7.50	6.46
Selling weight "	74.53	80.67	87.09	90.06	85.50	88.10	86.94
Selling price per cwt. $	16.00	16.40	16.50	16.50	16.50	16.40	16.40
Receipts per lamb $	11.92	13.23	14.37	14.86	14.11	14.45	14.26
Profit per lamb $	1.73	2.71	2.76	3.22	2.51	3.18	3.14
Dressing weight, av. lbs.	35.00	39.00	42.00	45.00	43.00	41.00	40.00
Dressing weight %	46.92	46.91	47.85	48.94	50.25	46.68	47.09

The above feed costs are based on the following prices: Corn $1.70 per cwt., oats $1.50 per cwt., barley $1.50 per cwt., dry pulp $1.05 per cwt., pressed pulp $2.50 per ton, cottonseed cake $2.50 per cwt., linseed cake $3.15 per cwt., molasses 75 cents per cwt., and alfalfa hay $10.00 per ton. The original cost of the lambs was 12 cents per pound.

Belle Fourche (cont'd)

The cheapest gains at the feed lots are not always the most profitable as is shown by comparing lot 1, which was fed dry pulp and alfalfa, with lot 11, which received corn, cottonseed cake, and alfalfa. This is accounted for by the smaller gain in lot 1 and the higher appraisal in lot 11. Dry pulp has about the same feed value as barley or oats when fed without a concentrate and a somewhat higher feed value when supplemented with cottonseed cake or linseed cake. In comparing the relative values of corn, barley, dry and pressed pulp, when fed either with or without a concentrate, the cottonseed cake or linseed cake has a much higher feed value in the pulp ration than with either corn or barley. Cottonseed cake and linseed cake balance the pulp ration, make more economical gains, and produce a better finished lamb, which, in turn, brings a higher price on the market. The results obtained this season show that the rations fed to lots 5, 11, 13, 14, 2, 10, and 3 returned the most profit in the order named.

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The work for the week ending March 9 consisted of caring for the stock, hauling hay, cleaning seed grain, and repairing machinery.

Lambing is coming along fine and will be completed in another week. Very few lambs have died.

The maximum temperature for the week was 60, minimum 23, and precipitation .12 inch.

The sugar beet acreage is being signed up and at this time is 10,000 acres, which will be increased another 2,000 or 3,000 acres before planting is completed. The production from this acreage will tax the present factory to the limit. There is now strong talk of establishing another factory on the project if a tariff is placed on sugar that will assure the operator a satisfactory profit.

Beyer Aune.

San Antonio

Report for the week ending March 2 and summary for the month of February.

The month of February was devoid of precipitation of agricultural importance, and as a result seedbeds for spring crops are very dry. Winter crops on the station do not appear to be suffering from lack of moisture, but pastures in this region are quite short and feed supplies will be inadequate if rain does not relieve the situation and provide pasturage in the near future. Rainfall for February was only .15 of an inch as compared with 1.70 inches for the period 1907 to 1928, inclusive.

Temperatures during February were subnormal, especially during the first two weeks of the month. The first and second weeks of the month were 11.5 and 8.4 degrees, respectively, below the mean of the month for the period 1907 to 1928, inclusive. The last two weeks of the month were warmer and more nearly approached the average. The mean temperature of the month was 49.0° F. as compared with 55.1° F. average for the period 1907 to 1928. There were seven killing frosts in February, five of which occurred on consecutive days. Evaporation for February was 2.604, which is slightly below normal. Eight days were clear, 9 were partly cloudy, and 11 were cloudy.

San Antonio (cont'd)

The weather for the week ending March 2 was very near normal in temperature with only one frost and a minimum of 27 degrees on February 28. No precipitation occurred. Four days were clear, two were partly cloudy, and one was cloudy.

Summary of climatological data

Week ending	Temperature (degrees F.) Maximum Absolute	Maximum Mean	Minimum Absolute	Minimum Mean	Mean	G. D. R.	Precipitation	Sky (days) Clear	Partly cloudy	Cloudy
							Inches			
March 2	76	70.0	27	40.3	55.1	38	---	4	3	1
Month of Feb.	79	61.0	20	36.9	49.0	46	.15	8	9	11

Field work was possible all of the past week. This consisted of plowing the remainder of field ABC-7, plowing the pasture east of the garden, mowing the field peas on plot A4-17 for hay and plowing this plot, and disking corn and milo plots. Other work on the station consisted of pruning of fruit trees and grapes, work in the gardens and on the grounds, and miscellaneous repair jobs.

The weather during the week ending March 9, with the exception of the last day of the week, was very nearly ideal for spring field operations. Three days were clear, three were partly cloudy, and one was cloudy. The mean maximum temperature was 78.6, the absolute maximum being 89; the mean minimum temperature was 46.7, with a minimum of 37. The mean temperature for the week was 62.6 as compared with an average of 63.1 for the month of March during the period 1907 to 1928, inclusive. The greatest daily range was 49 degrees. There was .24 of an inch of precipitation. Spring growth of crops and grassland has started, and many fruit and ornamental trees have started growth.

During the week final preparation of corn plots was made and all rotation corn plots were planted. Preparation of milo and sorghum plots was also finished. Field C-3 was disked in preparation for a sorghum variety test; part of orchard B-3 was disked; the vineyards and nursery A-1 were weeded; and a spring garden was planted. The lawn was mowed for the first time this season. Other work was done on the grounds and about the buildings and greenhouse.

Dr. D. C. Neal, Pathologist, and his assistant, K. C. Gunn, of the office of Cotton, Rubber, and Other Tropical Plants, were at the station March 7-11 in connection with their cooperative work on rootrot at this station. With the cooperation of the R. B. George Machinery Company of San Antonio the ground was prepared for a rootrot experiment of deep tillage with and without fertilizers and soil disinfectants. This experiment is being conducted on a cooperator's farm northeast of San Antonio.

On the station, work was started on the rootrot experiment in field C-6 but, due to rain March 11, this was not finished and the application of the fertilizers will be completed by the station staff. A portion of the cotton and cowpeas grown in pots in the greenhouse was inoculated with rootrot material.

I. M. Atkins.

WEEKLY REPORTS
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI March 16, 1929 No. 6

Belle Fourche

During the week ending March 16 occurred the worst snow-storm of the year. There were 18 inches on the level, which amounted to 1.51 inches precipitation—the highest for March since 1908 when it was 1.65 for that month. This storm will probably delay field work for ten days or two weeks. The maximum temperature was 68° and the minimum 7°.

The following table summarizes the lambing results on the Field Station for 1929.

Type and Age	Number bred	Number lambed	Died before lambing	Ewes dry	Lambs born	Buck lambs	Ewe lambs	Living lambs 3/20	Bucks living 3/20	Ewes living 3/20	Per cent born	Per cent living
Hampshire 2-year old ...	9	7	1	1	14	7	7	11	4	7	156	122
Hampshire 3-year old ...	12	4	1	7	9	2	7	9	2	7	75	75
Hampshire 4-year old ...	6	6	---	--	13	9	4	13	9	4	217	217
Hampshire 5-year old ...	7	5	1	1	9	5	4	8	5	3	129	114
Hampshire, old	3	3	---	--	4	2	2	4	2	2	133	133
Grade IXH, 3 years	11	9	---	2	22	14	8	18	13	5	200	164
Grade IXH, 4 years	18	17	1	--	39	18	21	36	16	20	217	200
Grade IXH, 5 years	12	12	---	--	23	14	9	20	12	8	192	167
Grade 2XH, 2 years	15	11	1	3	17	6	11	14	5	9	113	93
Grade 2XH, 3 years	8	5	---	3	10	5	5	10	5	5	125	125
Totals ...	101	79	5	17	160	82	78	143	73	70	158	142

From the 25 Hampshire ewes that lambed there were born 7 singles, 13 sets of twins, 4 sets of triplets, and 1 set of quadruplets. From the 54 grades that lambed there were 13 singles, 27 sets of twins, 12 sets of triplets, and 2 sets of quadruplets. One ewe died since lambing.

Beyer Aune.

Limoneira Laboratory

Report for week ending March 16.

We are still carrying on our survey of the water sources of southern California. The recent rains have made an appreciable change in all the streams, otherwise nothing of particular interest has shown up. We have now completed 730 water samples and 160 leaf samples.

Limoneira Laboratory (cont'd)

The following table shows the results of a series of boron determinations on lemon leaves. These data are arranged in the table in the order of increasing boron content of the leaves. There seems to be a relation between the boron in the leaves and the degree of injury and also between the boron in the leaves and the boron in the water, although in the latter case there are a few exceptions. These leaf samples were collected during the fall of 1928 and the early spring of 1929. Only mature leaves are selected for analysis.

The boron content of lemon leaves from several localities in southern California and Arizona. Expressed in parts per million and referenced to the dry weight of the leaf.

Lab. No.	Location	Extent of injury	P.p.m. of boron In leaves	P.p.m. of boron In water*
125	Fleischman, Montecito	None	38	0.20
124	Hubbard, Carpinteria	None	55	--
69	Drake, Carpinteria	Not typical boron injury	68	.80
109	Irvine Ranch, Tustin	None	68	--
122	Drake, Carpinteria	Not typical boron injury	70	.80
123	Drake, Carpinteria	Not typical boron injury	88	.80
118	Fithian, Carpinteria	None	88	.14
72	Snow, Goleta	Not typical	90	----
5	Adam, Santa Maria	Very slight	95	.50
87	Indio Date Garden, Indio	None	130	---
156	Ralphs, San Fernando	Very slight	130	.35
117	Rubidoux stable manure plot, Riverside	None	125	.20
78	SW cor. Pacoima and 8th, San Fernando	None	147	.35
147	Blanchard, Santa Paula	None	150	.26
60	Beal, Chula Vista, Orchard 101	None	162	---
116	Rubidoux superphosphate plot, Riverside	Slight	178	.20
130	Teague McKevett, OOW., Santa Paula	Slight	178	.40
82	Metcalf, Holtville	Slight	198	---
160	Citrus Heights Development Co., Santa Rosa	None	202	---
84	Yuma Experiment Farm, Bard	Slight	208	.20
68	Rancho Sespe, Santa Paula	None	217	.85
63	Barnes, Chula Vista	---	220	---
154	Murphy, San Fernando Valley	None	228	.30
86	Yost, Oasis	Very slight	248	.15
62	Shaver, Chula Vista	---	260	.10
83	Yuma Experiment Farm, Bard	Chlorotic, not typical	285	.20
94	Blaisdell, Yuma Mesa	Suspicious symptoms	285	.20
91	Schreiber, Tapo District, Simi	---	302	.35
129	Teague-McKevett, Sec. 3, Row 69	Slight	330	.40

*Approximate boron content of the water used to irrigate the groves.

Limoneira Laboratory (cont'd)

(Table continued from preceding page)

Lab. No.	Location	Extent of injury	Ppm. of boron In leaves	Ppm. of boron In water*
90	Gale, Eagle Rock	Chlorotic	333	---
113	Goar, Riverside	Moderate	338	---
155	Hazeltine, San Fernando	None	352	.30
65	Sespe Rancho, Santa Paula	None	380	.55
140	Citrola Ranch, Piru	Very severe	465	1.00
153	Bowman, Chatsworth Blvd., San Fernando	Slight	465	.70
61	Coleman, Chula Vista	---	470	---
115	Rubidoux Experiment Station, boron treated	Severe	505	.20
64	Tujunga Wash, San Fernando Valley	Severe	510	.70
149	Mission Blvd., San Fernando	Moderate	520	.70
150	Curtiss, 8-acre block, San Fernando	Slight	575	.70
114	Carpenter, San Bernardino	Very severe	580	.80
159	Chatsworth, opposite school,	Moderate	585	.70
103	Botsford, San Fernando, Tujunga	Severe	600	.70
136	W arring, Piru	Slight	625	1.30
108	Irvine Ranch, Tustin	Severe	633	---
76	Radatz, Van Nuys Blvd., San Fernando	Very severe	640	.70
151	Curtiss, North 15 acres, San Fernando	Severe	645	.70
158	Radatz, Van Nuys Blvd., San Fernando	Very severe	668	.70
139	Padelford, Piru	Severe	675	.80
142	Carter, Piru	Moderate	732	.80
75	Chatsworth, opposite school	Severe	757	.70
67	Sespe Ave., end of paving	Severe	840	2.50
143	Sespe Ave., end of paving	Severe	865	2.50
131	Spencer, Piru	Very severe	875	1.60
73	Lewis, Carpinteria	Severe	992	1.90

*Approximate boron content of the water used to irrigate the groves.

L. V. Wilcox.

Prosser

Laboratory work during the week ending March 16 consisted of making calcium and magnesium determinations on a number of irrigation and drainage water samples, and determining at the beginning of the season the amount of moisture in the soil from different fields of the Station farm.

Water was turned into the main canal on March 14, and will probably be available to most of the farmers in the lower valley in about two weeks. Its greatest use at this time of the year is in applying the dormant spray to the orchards. It is also needed badly on many farms for stock. Most of the farms in the lower valley depend on cisterns for stock-water during the winter, and in many cases the supply is exhausted by March 15 or earlier.

Field work at the Prosser station opened about March 1. At the present time wheat, barley, and oats have been sown on 17 duplicate variety plots, and wheat has been sown on a series of one-half acre

Prosser (cont'd)

plots for irrigation experiments. About 75 strains have also been planted in the wheat nursery.

Using two manure spreaders, all of the early potato plots have been covered at the rate of about 20 tons per acre. About 40 tons of manure have also been spread on a 2-acre field used for irrigation experiments with corn. It is planned to disk this manure in immediately after it is applied and then irrigate the land just before planting.

Thirty of the beef cattle on the Station have been sold. They brought $90.80 per head at the farm. This is not enough to make the feeding operations profitable this year.

Good alfalfa hay is selling at $19 to $20 per ton in the stack.

C. C. Wright.

San Antonio

Meteorological data recorded for the week ending March 16 were as follows: Maximum temperature 77, mean maximum 73.1; minimum temperature 42, mean minimum 50.6; mean temperature 61.9; greatest daily range, 35 degrees; precipitation, 1.42 inches. Two days were clear, two were partly cloudy, and three were cloudy during the week. The precipitation came in the form of a slow, penetrating rain over a two-day period. This provided moisture for the germination of corn and for the sorghum and milo seedbeds, and also supplied much needed moisture to small grains and to ornamental and fruit trees.

The first three days of the week field work was impossible, and the time was spent doing miscellaneous work about the buildings and greenhouse. During the last three days of the week field work consisted of final preparation of the milo plots for planting; planting all milo rotation plots; harrowing Field B-4 and part of the rotation plots to be planted to forage sorghum; disking Field C-6 and part of Field C-3; and chopping out large weeds in the rotation plots.

I. M. Atkins.

Scotts Bluff

The average maximum temperature for the last four days of the week ending March 16 was 37, with a maximum of 42 on the 16th; the average minimum temperature for the week was 28, with a minimum of 20 on the 10th. Precipitation for the week was .15 inch.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; barley at elevator, $1.40 per hundredweight; corn, $1.75 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 51 cents per pound; and eggs, 25 cents per dozen.

The price of cattle advanced from 50 cents to a dollar during the week, with choice steers bringing $14 per hundredweight. Hogs showed even a greater advance with tops at $11.60 per hundredweight. The lamb market was erratic. On Wednesday a new season's top of $17.75 was paid by both packers and shippers, but a severe break followed which carried prices below the previous week.

Dean Burr and Regent Marsh of the University were in the Valley during the week, but as the roads are blockaded by snow-drifts they did not get out to the station.

James A. Holden.

Umatilla

The winter here was very open until late January and early February. After a snow of 11 inches, amounting to 1 inch of precipitation, the weather cleared and it was below zero for twelve nights, the minimum being —27. The frost penetrated the ground more than ever before, probably on account of its being very wet from heavy rains about the first of the year. Stock suffered considerably, and the price of hay jumped to $25 per ton f.o.b. cars. The farmers profited little from this advance, however, as the dealers had bought and stored the hay last fall. Sheepmen used most of it, as they were either in the lambing season or just approaching it. The lamb crop will be about 25 per cent short.

Interest in growing Jerusalem artichokes has been very keen during the past few months in Oregon. Representatives of eastern firms have looked into the situation with the possibility of developing the crop for human consumption, as it is a very important food in the diet of diabetic patients. Methods of extracting the sugar have been perfected so it appears that that phase also has a future.

The interest in artichokes in the eastern part of Oregon has centered on the Umatilla Project because the conditions here are ideal for a long fall harvesting season. One of the companies contracted all of the artichokes growing here for seed purposes. As yet no contracts for commercial growing have been let. Uniform sets of experiments have been requested by the company at four points in the State. One of these will be at this Station.

The lamb-feeding tests, covering a period of 100 days, will be completed on March 23. Two lots have been on alfalfa meal, two on chopped alfalfa, and two on long alfalfa with 1 pound per head daily of whole barley. A detailed report of this experiment will be made.

H. K. Dean.

Yuma

The maximum temperature for the two-week period ending March 9 was 89, mean maximum 79; minimum 30, mean minimum 40; greatest daily range 45; precipitation, trace.

The U. S. Weather Bureau station at Yuma, Arizona, reports the mean temperature for the month of February to be 3.6 degrees below normal and 3 degrees colder than February 1928. The average mean temperature this year was the lowest for any February since 1894.

With only a trace of rainfall reported for the month, this is the fourteenth consecutive month with subnormal precipitation.

The Colorado River discharge at Yuma for February this year was 268,900 acre-feet. In February 1928 it was 444,000 acre-feet. The 27-year average for the month is 684,400 acre-feet. The 27-year maximum was 2,188,000 acre-feet and occurred in 1916. The minimum of 182,500 acre-feet was recorded in 1903.

Practically all cotton gins on the project have closed for the season. The total for all the gins was 31,641 bales. Possibly 2,500 bales of this amount were raised in the lower Gila Valley districts.

Early estimates of the 1929 cotton acreage indicate that 35,000 acres will be planted. Land is being prepared for cotton planting in all sections of the project. The weather so far, with the exception of four

Yuma (cont'd)

days of the past week, has been unfavorable for planting. High winds and low temperatures have been recorded the last three weeks.

Station work for the last two weeks included the preparation of land and planting of cotton on the maximum production tests; leveling and bordering plots in the rotations for irrigating; cleaning ditches; pruning and pollinating date palms; general hoeing, cultivating, and irrigating.

E. G. Noble.

On March 18 Mr. Noble reported as follows:

"The three borders of cotton in the maximum production test have been planted: One, to three strains of Pima; one-half a border each to Lonestar and Mebane; and one border to Acala. Tomorrow these same varieties will be planted, in similar proportions, on land that has been given a different treatment from that on which the first plantings were made. Two more plots have been watered for Pima plantings. Seed of the Pima X Sakel and the 5-3 strains has been obtained. The Lonestar is Creswell's stock, and the Mebane is an improved variety from the Yuma Valley.

"The rotations will be ready to plant tomorrow and should be completed on time. The weather at present is just about right, but a wind may be expected at any time. Planting over all the project is advanced this year. Although no reliable estimate of the 1929 cotton acreage has yet been made, it undoubtedly will exceed 33,000 acres."

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI March 23-30, 1929 No. 7

Belle Fourche

During the week ending March 23 the maximum temperature was 48, the minimum temperature 5, and the precipitation .24 inch.

There was another snow-storm this week, and it is going to delay field work for at least ten days.

The work during the week consisted of general care of stock, cleaning seed grain, and repairing machinery.

Beyer Aune.

Huntley

Report for the period January 1 to March 23.

Intensely cold weather prevailed for the most part from the middle of January through most of February. During the period under consideration the absolute minimum temperature recorded was 40 degrees below zero; this reading was made on January 31. Beginning with January 17 and continuing until February 10, with one exception, the minimum daily temperature was below zero, ranging from 1 to 40 degrees below zero. The maximum temperature during this same period was 29 degrees above, this being recorded on February 10. On many days during this period, however, the maximum temperature also was below zero, attaining 18 below as a maximum on January 29.

Relatively warm weather prevailed during the last few days of February and early March, as a result of which the winter's fall of snow was entirely dissipated. A six-inch snowfall occurred on March 12 and 13, but with the return of warm weather was soon melted. The frost is gradually leaving the ground, but fields are extremely wet and side roads almost impassable due to their muddy condition. It is hoped that fields will dry out so as to permit of field work about April 1.

The unusually severe weather during the winter has required more than the usual amount of winter feeding. The supply of hay locally, however, appears to be ample and the price has not advanced above $10 per ton.

Measurement of the test wells on the station has been almost at a standstill during the winter months. Measurements were made on January 3 and 10, following which no further readings were possible until March 7.

Lambing in the small farm flock at the station has been in progress during the past ten days.

Notice of the removal of the present Assistant County Agent for Yellowstone County, who has been in charge of extension work on the Huntley Project, was recently received. Mr. T. B. Hooker has been appointed as his successor.

A. E. Seamans, of the Dry-Land Office, left the station on March 8 for a visit to the Cheyenne station. He returned to Huntley on March 14.

During the week ending March 30 the maximum temperature was 72, minimum 10, and greatest daily range 37. Precipitation in the form of snow amounted to .60 inch. With rather warm weather and the prevalence of relatively brisk northwest winds, the ground has dried out rapidly

Huntley (cont'd)

during this period. With a continuation of these conditions, it should be possible to begin spring work on the dry-land project within the next week.

The cleaning of seed grains has been in progress at the station during the past week. Harness has also been in process of a thorough cleaning and renovation.

Messrs. Hansen and Seamans left for Bozeman on March 25 for the purpose of conferring with officials of the State Experiment Station concerning plans for crop work during the current season. They returned to Huntley the night of March 26.

Mr. T. W. Moseley, Associate Dairy Husbandman at the station since 1921, has been transferred to Beltsville, Maryland, effective May 1. Tentative plans call for the transfer of Mr. D. V. Kopland from the Ardmore, South Dakota, station to succeed Mr. Moseley.

Station visitors during the week included W. C. Doherty, Manager, and Bruce Petriken, Agricultural Superintendent, of the Great Western Sugar Company factory at Billings, and Mr. Asa C.Maxson of the Longmont, Colorado, office of the same Company.

Dan Hansen.

Newlands

The following meteorological data were recorded at this station during the four-week period ending March 23: Mean maximum 58, maximum 67 on March 9 and 20; mean minimum 25, minimum 12 on February 26. There was .07 of an inch of rainfall on March 10, .13 inch on the 18th, .33 inch on the 22d, and .17 inch on the 23d, making a total of .70 inch for the period.

During this period the corrals and buildings about the dairy barns have been whitewashed and a new calf pen built. Wheat has been planted on plots D-4, D-8, E-3, E-4, E-5, E-6, F-8, Y-9, Y-10, and Y-18, barley on F-6, and oats on Y-6, Y-7, and Y-8. Plots B-2, 3, 4, 5, 7, 8, 9, 10, 11, C-6, 7, 8, 9, and 10 were irrigated on March 16.

The boron work in the laboratory is progressing satisfactorily. Many analyses have been made and the water elevations of the 25 wells determined and referenced to sea-level. The work so far has shown that there is a wide range in the total amounts of alkaline salts and boron in solution in the waters from these various wells. A great many phases of research along these lines are apparent as this work progresses. In fact, so great are the various angles of this problem that enough laboratory work could be outlined at this time to keep a chemist busily engaged for an entire year. The lines of investigation to be followed will be decided as soon as the preliminary work has been thoroughly analyzed by Mr. Scofield.

E. W. Knight.

San Antonio

The following meteorological data were recorded for the week ending March 23: Maximum temperature 92, mean maximum 72.7; minimum temperature 47, mean minimum 54.0; mean temperature 63.4 as compared with the mean temperature of 62.1 for the month of March for the period 1907 to 1928, inclusive. The greatest daily range was 35 degrees. There was .81 of an

San Antonio (cont'd)

inch of precipitation during the week, occurring in measurable quantities on five days. During the week five days were cloudy, one partly cloudy, and one clear.

The weather of the past week was favorable for the growth of all field crops. Small grains in rotations, pastures, and in the variety test have made rapid progress and are nearing the heading stage. Flax has recovered from the freeze of February 11 and is growing nicely, although the stands in the variety test were reduced from 15 to 70 per cent of the original. Corn in the rotations has emerged to good stands, and milo planted on the 16th had emerged to good stands by the 23d.

Field work during the week was interrupted frequently by showers. Fields C-3 and B-4 were disked and B-4 was harrowed in preparation for a sorghum variety test and a corn variety test, respectively. Part of field AB-8 was plowed.

All orchards were disked and hand weeding was started. A row of palms (Inodes sp.) was planted along the South Flores road on either side of the farmstead grounds, extending from the north side of orchard A-1 to the south edge of orchard A-3.

Messrs. Dawson, Jordan, and Jenkins of the Bureau of Chemistry and Soils, Austin, Texas, spent March 18 to 20, inclusive, and March 23 at the station applying fertilizers and soil disinfectants in connection with their experiments on the control of cotton rootrot.

The following meteorological data were recorded for the week ending March 30 and for the month of March:

Week ending	Temperature (degrees F.)					G. D. R.	Precipitation	Sky (days)		
	Maximum		Minimum		Mean			Clear	Partly cloudy	Cloudy
	Absolute	Mean	Absolute	Mean						
							Inches			
March 30	89	81.7	54	63.0	72.4	23	.17	1	4	2
Month of March	92	76.3	27	52.2	64.3	49	2.64	9	11	11

Temperatures during March have been slightly above normal. The mean for the month was 64.3 as compared with a mean of 62.1 for March for the past 22 years. The minimum temperature of 27 occurred on the first day of the month but did no damage. No other frosts occurred. Although it was cloudy much of the time, growing conditions during the month were favorable. Precipitation for the month was 2.64 inches, which is .76 inch above normal. This precipitation came in the form of showers or slow rains, all of which was available to crops. Wind movement for the month averaged 4.08 miles per hour, which is slightly below the normal. Evaporation from a free-water surface amounted to 4.07 inches as compared with 4.59 inches normal for the month of March.

Corn and sorghums were planted during the month and nearly all have emerged to good stands. Small grains and flax have made good growth. Rust infection in the small grains has been low to date and has done no damage.

The weather of the past week was favorable for crop growth and although cloudy most of the time field work was possible with the exception of one day. Field work consisted of planting a corn variety test

San Antonio (cont'd)

and corn spacing test in field B-4; harrowing and planting both drilled and row sorghum plots in the rotations; planting a variety test of grain sorghums in field C-3 and a variety test of forage sorghums and broomcorn in field B-7; harrowing and planting the pasture to Sudan and harrowing all corn plots for weed control. Fertilizers and soil disinfectants were applied in the cotton rootrot experiment on field C-6 for Dr. D. C. Neal, Office of Cotton, Rubber, and Other Tropical Plants, Greenville, Texas.

Hand work consisted of weeding fallow plots, weeding orchards, care of the grounds, and making a planting of Bamboo in the nursery with plants supplied by the Office of Foreign Plant Introduction.

I. M. Atkins.

Scotts Bluff

The average maximum temperature for the week ending March 23 was 42, with a maximum of 53 on the 17th; the average minimum temperature was 21, with a minimum of 5 on the 21st. The precipitation was .41 inch.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.75 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 49 cents per pound; and eggs, 23 cents per dozen.

James A. Holden.

Yuma

Report for the two-week period ending March 30.

The maximum temperature for the month of March was 93.5; mean maximum, 79.2; minimum 31, mean minimum 42.2; mean 60.7; greatest daily range 51; precipitation, trace.

The frost which occurred on the 25th was about two weeks later than normal. Although cotton had been planted over a large area on the project, there was no frost damage reported. Windy and cool weather, however, have caused poor germination in some fields and replanting will become necessary.

Through the activity of the Division of Plant Pathology of the University of Arizona, a cotton seed delinter has been installed at Somerton, Arizona. Many of the growers on the Arizona side of the project are having their planting seed delinted.

Cotton planting on the station has been completed with the exception of two plots in the maximum production test. These were planted on March 4, but on account of poor stands were plowed up. The planting of these lands will be completed about April 4. The stands of cotton in the rotations appear to be very satisfactory. The cooperative series planted March 23 has not yet emerged.

Station work performed during this period included the planting of cotton tests; cleaning and repairing ditches; releveling plots; pruning and pollinating date palms; and general cultivating and hoeing.

Mr. and Mrs. Scofield visited the station on March 7 while en route to Phoenix, Arizona, and again on March 14 when returning from that city.

Yuma (cont'd)

Count Knute-Kuntzenborg, of Denmark, and his sister the Countess were station visitors on March 24.

Mr. Arthur T. Bartell a graduate of the University of Idaho, who was taking a postgraduate course in the Kansas State Agricultural College at Manhattan when appointed Junior Agronomist and Assistant Superintendent of this station, reported for duty on March 16.

E. G. Noble.

W E E K L Y R E P O R T S
Of The Office Of
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Vol. XXXI April 6-13, 1929 No. 8

Belle Fourche

The maximum temperature during the week ending April 6 was 76, minimum 14, and precipitation .18 of an inch.

Snow-storms have continued here and practically no field work has been done, but work in the field may be possible in a few days. We should be able to plant the sugar beets the last of this month or the first of May.

The sheep and lambs are doing fine. Four of the sows have farrowed and at this writing there are 34 living pigs.

For the week ending April 13 the maximum temperature was 53, minimum 11, and precipitation .38 inch.

Beyer Aune.

Huntley

During the week ending April 6 the maximum temperature was 75, minimum 18, and greatest daily range 43. Precipitation, both rain and snow, amounted to .45 inch.

Field work on the dry-land project was inaugurated to a limited extent during this period.

At a meeting of the Huntley Project Development Association, held in Ballantine on the evening of April 5, the proposal of the Montana Power Company for the electrification of the project was discussed. Briefly, the plan under consideration provides for the consumer to agree to contract for light or power service for a period of not less than three years and pay a service charge of $3.00 per month in addition to the regular published rates of the company. It is understood that the service charge of $3.00 is an estimated amount based on a charge of 27 cents per month per 100 feet of line extension at primary voltage for each consumer contracting for service. The service charge is intended to cover interest, taxes, depreciation, maintenance, and contingency expense on the excessive investment in distribution due to the small number of consumers per mile of line. Committees are busily engaged at present in circulating the necessary subscription agreements, of which it is understood there must be at least 190 signers before the company will undertake this installation.

Station visitors during the week included J. R. Dawson and R. V. Kopland, members of the staff of the Bureau of Dairy Industry, from Washington, D. C., and Ardmore, South Dakota, respectively.

The maximum temperature during the week ending April 13 was 55, minimum 17, and precipitation .15 inch.

Field work on the dry-land project has progressed rather slowly since its inauguration due to frequent light showers and snow flurries. Seeding of spring wheat and small grains will probably begin next week. No field work as yet has been accomplished on the irrigated land.

Huntley (cont'd)

Mr. Moseley left the station Saturday morning, April 13, for his new headquarters at Beltsville, Maryland.

Dan Hansen.

Limoneira Laboratory

Mr. Scofield made a trip into Arizona the second week in March. He reports little evidence of boron injury there.

Mr. Scofield and son Francis left the Limoneira on April 4 and spent the next two days in the vicinity of Bakersfield, California. In the foothill region east of Bakersfield they found definite boron injury. The water samples that they brought back showed high boron content. An interesting feature of this trip was the observation by Mr. Scofield of a rather severe leaf injury on red gum trees (eucalyptus). Boron injury was suspected and a sample of the leaves was brought in to the laboratory for analysis. We found 1,000 parts per million of boron, which confirms Mr. Scofield's idea that the injury was due to boron.

We have now handled in the laboratory 840 water samples and 168 leaf samples.

L. V. Wilcox.

Newlands

The following meteorological data were recorded at this station during the three-week period ending April 13: Mean maximum 56.7, maximum 72 on April 2; mean minimum 23.8, minimum 14 on April 7 and 10. A little snow fell on April 4, 5, 6, and 8, amounting altogether to .03 inch of precipitation. The low temperature of April 7 and 10 did quite a little damage to the fruit in this locality.

During this period repairs of various kinds have been made. The irrigation boxes, ditches, and drains have been repaired and cleaned in preparation for the irrigation season. The field work has consisted of releveling plots A-3, C-11, 12, and 13. D-3 has been planted to sugar beets. The plots irrigated were A-3, B-5, 6, C-6, 7, 8, 9, and 10.

Boron Investigation

During the winter it was decided to conduct an investigation of the underground water of the Newlands Experiment Farm, covering the following points:

1. The height of the underground water referenced to sea level.
2. The total salts in solution in the underground water-
   (a) Conductance of the solution by use of electrolytic cells.
   (b) Quantitative determinations of the various salts in solution with special emphasis on the amount of boron salts to be found.

A series of wells were drilled over the farm area 585 feet apart from west to east and 600 feet apart from north to south, making a total of 25 wells. Fairly large soil samples were taken from each soil horizon encountered in the separate holes at the time of drilling. The wells were drilled to a depth where free water was struck, and after this water had come to equilibrium the depth was determined and a two-gallon sample obtained. The water depth taken was referenced to sea level and determinations made as to the kinds and amounts of salts.

Newlands (cont'd)

The analyses of the 25 water samples have been completed. The following diagrammatic tables cover most of the work done in this investigation to date.

The following diagram shows the boron content of the underground waters on the Newlands Experiment Farm as sampled by Venstrom and Knight and determined by Venstrom during January and February 1929. The wells from which samples were taken were put down in lines across the farm, 585 feet apart from east to west and 600 feet apart from north to south. The boron content of the water obtained from each well is expressed in parts per million.

North

Boron content (parts per million)

	.53	1.20	.61	tr.	2.10	
	8.80	1.50	26.00	6.20	.37	
West	1.00	9.20	1.84	.34	2.50	East
	8.60	.48	1.58	5.00	1.37	
	3.20	2.90	3.60	.87	2.30	

South

The elevation of the underground water, Newlands Experiment Farm, as observed in the boron survey of January 1929. The wells are 585 feet apart from east to west and 600 feet apart from north to south. The elevations given are plus 3950 feet above sea level.

North

	Feet	Feet	Feet	Feet	Feet	
	6.43	4.84	4.91	4.58	4.24	
	5.96	5.40	4.93	4.49	4.25	
West	6.41	6.08	5.42	4.58	3.91	East
	5.87	5.60	4.99	4.84	4.85	
	5.02	4.50	4.16	3.30	2.80	

South

Newlands (cont'd)

The salt content of the underground water, Newlands Experiment Farm, as observed in the boron survey of January 1929. Expressed as conductance ($K \times 10^{-5}$ at 25° C.)

North

	84	102	66	35	139	
	240	181	1112	256	50	
West	186	346	217	82	458	East
	1113	65	198	337	186	
	256	242	346	133	285	

South

E. W. Knight.

Prosser

Report dated April 6.

Samples of soil from a number of alkali plots near Mabton have been collected this spring and conductance (K_s) readings made on them. These plots have been under observation for three years and have been given different chemical or fertilizer treatments. The following table gives the treatment of each plot and the conductance of each foot-section of soil to a depth of 4 feet.

Chemical treatments and electrical conductance of soil on alkali plots near Mabton, Washington.

Plot	Treatment	Depth sampled	Conductance (K_s)
		Feet	
1	2,000 lbs. Gypsum per acre per year	1	480
1	2,000 " " " " " "	2	1,150
1	2,000 " " " " " "	3	606
1	2,000 " " " " " "	4	292
2	3,000 lbs. Gypsum per acre per year	1	96
2	3,000 " " " " " "	2	180
2	3,000 " " " " " "	3	238
2	3,000 " " " " " "	4	345
3	2,000 lbs. Lime per acre first 2 yrs.		
	5,000 lbs. aluminum sulphate last year	1	153
3	Same	2	810
3	Same	3	1275
3	Same	4	1005
4	2,000 lbs. Sulphur per acre per year	1	96
4	2,000 " " " " " "	2	230
4	2,000 " " " " " "	3	384
4	2,000 " " " " " "	4	384

(Table cont'd on next page)

Prosser (cont'd)

(Table continued from preceding page)

Plot	Treatment	Depth sampled	Conductance (K_s)
		feet	
6	No treatment (check)	1	550
6	" " "	2	1,177
6	" " "	3	797
6	" " "	4	153
7	3,000 lbs. Sulphur per acre per year	1	134
7	3,000 " " " " " "	2	75
7	3,000 " " " " " "	3	190
7	3,000 " " " " " "	4	285

Farm work on the station at present consists chiefly of spreading manure, plowing and preparing different fields for new alfalfa, and sweet clover seeding. A number of fields are now ready for seeding, but on account of strong winds it is thought inadvisable to plant until irrigation water is available. Water is in the main canal, but the Prosser district under which the station is located is served by a pump and as yet it has not been started.

The following prices prevailed during the week: Alfalfa hay, baled, $22 per ton; corn, $1.90 per hundredweight; wheat, $1.65 per hundredweight; potatoes, $12 to $14 per ton.

C. C. Wright.

Rubidoux Laboratory

The Boron Content of Irrigation Supplies in the Bakersfield area, California

There appears to be an area southeast of Bakersfield, California, where the underground waters contain boron in injurious quantities. A survey of this area on April 5, 1929, when a number of samples of water were taken for analysis, disclosed the fact that some of the waters in this area were known to be injurious to crops, particularly to grapes and apricots.

A sample of water from a well about half a mile southeast of the Weed Patch Store, taken on February 5, showed 60 parts per 100 million of boron; and a few orange trees that had been irrigated for some years with that water showed characteristic symptoms of boron injury.

A sample of water taken on February 26, at the request of Messrs. Ballard and Schmidt, from a well at the northwest corner of section 17, T. 31, R. 30, near the Rock Pile School, showed 176 parts per 100 million of boron, and was said to have been injurious to grapes.

In the survey of April 5 a spring was found near the southwest corner of section 3 - 31 - 30, in the pasture of El Tejon Ranch. Two samples of water were taken at this spring which showed slightly more than 700 parts per 100 million of boron.

A well at the Neumarkel Ranch at the southeast corner of section 20, T. 30, R. 30, showed 666 parts per 100 million of boron. This water had been used since 1924 on garden crops and various fruit trees, including some citrus. It has proven injurious to many species. The citrus trees were all dead or dying.

Rubidoux Laboratory (cont'd)

Two samples of water from a well on the north line of S. 7 - 31 - 30 showed 33 and 54 parts per 100 million of boron. The water from these wells is said to be not injurious to crops. They are one mile north of the Rock Pile School where a boron content of 176 parts per 100 million was found on February 26.

Two wells on the section line west of the Rock Pile School were sampled. One of these, at the center of the north line of Section 18 - 31 - 30, showed 464 parts per 100 million of boron, while the second, which is at the northeast corner of Section 13 - 31 - 29, showed 451 parts per 100 million. The water from both these wells is said to be injurious to crops. Near the first of these wells a tree of red gum showed severe leaf injury. A sample of these leaves when tested for boron showed 1000 parts per million of that element, based on the dry weight of the leaves.

A sample of water from a well located near the center of Section 17 - 31 - 30 showed 96 parts per 100 million of boron. So far as is known, this water has not caused injury though it may not have been used on susceptible crops.

A sample of water from the center of the west line of Section 13, T. 31, R. 29, referred to as the Edmundson well, showed 194 parts per 100 million of boron. Another well one mile west of the Edmundson well, belonging to Yaussey, showed 49 parts per 100 million of boron; while another well 2 miles west and one-half mile south of the Yaussey well showed 62 parts per 100 million, which is about the same as was found in the well near the Weed Patch Store.

The results of this survey indicate that there is an area northeast of the Rock Pile School where the underground waters contain a high proportion of boron. These waters are tapped in the vicinity of the Rock Pile School, though wells only one mile north of the school do not show much boron.

All of the waters sampled in this high-boron area showed a very low content of total salts. The specific conductances ($K \times 10^{-5}$ at 25°) ranged from 30 to 82, indicating a total salt content from 175 parts per million to 500 parts per million. In view of these finds, it seems highly probable that such injury as has been observed from the use of these waters is due chiefly to their boron content.

C. S. Scofield.

San Antonio

During the week ending April 6 the following meteorological data were recorded: Maximum temperature 92, mean maximum 86.7; minimum 59, mean minimum 66.0; mean 76.4. The greatest daily range was 33 degrees. One day was clear, four days were partly cloudy, and two were cloudy during the week. No precipitation was recorded. The weather of the past week has been dry and windy, and moisture of the surface soil has been rapidly depleted. Seedbeds for cotton are too dry to insure germination in many cases. Small grains are in need of moisture, as the lower leaves of the plants are dying. Corn and sorghums are growing well and are not suffering for moisture as are the small grains. Flax in the nursery has nearly all bloomed and set seed and the varieties in the variety test are blooming.

Field work was possible the entire week. Ground was prepared and Sudan grass planted in the two rotation plots as scheduled; Field F-3 was replowed to control Johnson grass and prepared for cotton planting; all rotation plots to be planted to cotton were disked; plots to be plowed

San Antonio (cont'd)

in April in the rootrot-fallow experiment in field C-5 were plowed; all corn plots in the rotations were thinned; and part of the corn plots were cultivated for the first time.

A large number of citrus seedlings, received from the Office of Crop Physiology and Plant Breeding, were planted in Nursery A-3. Hand work consisted of care of the grounds, weeding, watering newly planted trees, weeding and watering the garden, and other miscellaneous work.

Mr. Bruce Caldwell, of the Biophysical Laboratory, was a visitor at the station April 3 and 4. He directed the planting of cotton and laying of paper in a test to compare paper-mulched and un-mulched cotton.

The meteorological data recorded for the week ending April 13 follow: Maximum temperature 83, mean maximum 78.7; minimum 53, mean minimum 59.7; mean 69.2; greatest daily range 26 degrees. There were 2.53 inches of precipitation. One day was clear, three days were cloudy, and three partly cloudy during the week. Thunderstorms occurred on the 7th, 8th, and 10th. Hailstones, most of which were about three-eighths of an inch in diameter, fell intermittently during the thunderstorm of the 10th. As no wind accompanied the storm, the damage from the hail was negligible.

The cloudy weather of the past week had been favorable for rust infection in the small grains. While no serious damage has resulted to date, further cloudy, damp weather will no doubt permit widespread rust infection and considerable damage. Small grains except late varieties are almost fully headed. Flax is in full bloom and early varieties and plantings have set seed.

Field work was possible only the last two days of the week. All milo and part of the corn plots in the rotations were cultivated and part were hand-weeded. A planting of Tamarisk cuttings was made between the palms along the south Flores road. Care of the grounds, weeding orchards, care of the garden, and other miscellaneous work occupied the remainder of the time.

I. M. Atkins.

Scotts Bluff

The average maximum temperature for the week ending April 6 was 62, with a maximum of 78 on the 4th and 6th; the average minimum temperature was 29, with a minimum of 16 on the 1st. The precipitation was .17 inch, and the evaporation for the last four days was .431 inch.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.75 per hundredweight; barley, $1.40 per hundredweight; potatoes, 50 to 60 cents per hundredweight; butterfat, 46 cents per pound; and eggs, 23 cents per dozen.

During the week the men were busy hauling manure and doing general farm work.

Ninety-three head of yearling steers were sold from the station, bringing $12.50 per hundredweight delivered to Scottsbluff, Nebraska. We also sold 29 head of lambs and 2 head of ewes. The lambs brought $15.90 per hundredweight and the ewes $9.50 per hundredweight.

Scotts Bluff (cont'd)

The average maximum temperature for the week ending April 13 was 51, with a maximum of 72 on the 7th; the average minimum temperature was 26, with a minimum of 12 on the 11th. The precipitation was .08 inch.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn at elevator, $1.70 per hundredweight; barley, $1.50 per hundredweight; potatoes, 40 to 50 cents per hundredweight; butterfat, 46 cents per pound; eggs, 23 cents per dozen.

During the week the men were busy hauling manure and plowing.

James A. Holden.

Yuma

The maximum temperature for the two-week period ending April 13 was 89, minimum 30.5, greatest daily range 48, precipitation none. Eleven days were clear, one was cloudy, and one partly cloudy. The cool weather with high winds which prevailed during most of March continued intermittently during the past two weeks.

Young cotton is making a very slow growth. The heavy frost on April 8 killed some cotton in the lower Yuma Valley. This is now being replanted. On the station the frost damage to the cotton was estimated to be about 10 per cent. Some grape vines and young growth on the citrus trees were also touched by the frost. Tomatoes, cantaloupes, and watermelons were not damaged. Severe damage to deciduous fruit crops up State was reported.

Although a general rain was reported all along the coast of California, no moisture has fallen here, not even a trace.

Station work during the two-week period has included the harvesting of the first cutting of alfalfa hay, leveling roads, pruning and pollinating date palms, sawing wood, and general irrigating and cultivating.

E. G. Noble.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI | April 20-27, 1929 | No. 9

Belle Fourche

The maximum temperature for the week ending April 20 was 70, minimum 28, and precipitation .34 of an inch.

During the week the varieties of wheat, oats, barley, field peas, and garden peas were planted. All the plots in field A to be planted this spring were disked or duckfooted, leveled, and harrowed.

The maximum production plots were duckfooted, leveled, and harrowed. Wheat, oats, barley, sugar beets, and mangels were planted in this experiment. All the plots in the dry-land rotations were made ready for planting.

On April 16 the time-of-planting beets were planted in the distance-of-spacing and time-of-thinning tests. The test comparing plowing for second year beets versus duckfooting was planted on the 16th. Oats and sweet clover were planted in field P and oats in field F.

On the 19th and 20th the superintendent attended the Harding County Wool Growers' meeting at Buffalo and gave a report on the lamb-feeding experiments. They are very much interested in the lamb-feeding work as the feeding gives them a better opportunity to dispose of their surplus lambs profitably.

For the week ending April 27 the maximum temperature was 67, minimum temperature 26, and precipitation .42 inch.

During the week the wheat, oats, barley, sugar beets, sweet clover, and alfalfa were planted in the irrigated rotations in field A. Field Y was double disked, floated, harrowed, and planted to Trebi barley and sweet clover. Field P along Deadman Creek was planted to Swedish Select oats and Grimm alfalfa. All of field G was double disked, floated, and harrowed in preparation for corn.

At the last weighing of the 140 spring lambs, born from February 22 to March 20, they averaged 40 pounds. The heaviest one weighed 72 pounds. This particular lamb has gained an average of almost one pound a day since birth.

The planting of crops on the project to date is very nearly normal, although the season has been rather cold and backward with more than the normal moisture. Field work is well along for this time of the year, largely because of the use of tractors in land preparation.

Over 12,000 acres have been signed up for sugar beets, and about two-thirds of the crop is already in. The Sugar Company has furnished considerable sweet clover and alfalfa seed. The company, through its field men, is making a general effort to put the farms on a systematic crop rotation basis with a view to increasing the livestock population so that the roughage and the sugar beet by-products will be fully utilized.

Beyer Aune.

Huntley

The maximum temperature for the week ending April 20 was 67 and the minimum 25. There was a trace of precipitation.

With favorable weather prevailing throughout the entire week, field work was possible continuously. Preparation of land and seeding of small grains in the dry-land rotation and in miscellaneous fields was completed. Plowing for corn, beans, and other late grains on the dry-land plots is well under way.

Preparation of land and seeding of beets and wheat in the irrigated rotation experiments, as well as in some of the miscellaneous experiments with these crops, was completed during the week.

The maximum temperature for the week ending April 27 was 65, minimum 21, and precipitation .23 of an inch. The precipitation held up field work for a day or two, but was not sufficient to fill present requirements. Surface moisture for most of the plots is inadequate and rain is needed rather badly to germinate those crops which have already been seeded.

The seeding of oats, flax, and alfalfa in the irrigated rotation experiments was completed during the week. Seeding of oats in miscellaneous tests was also accomplished. Potatoes, corn, and beans constitute the remaining crops to be planted in the rotation experiments. With favorable weather prevailing, the preparation of the land for these crops is being rapidly pushed forward.

The wheat variety test, conducted in cooperation with the Office of Cereal Crops and Diseases, is being made on plots L-II-3 to 9, inclusive. Wheat and wheat-flax mixtures were seeded on plots L-II-10 to 13, inclusive. Barley was seeded in the remainder of this series, plots 14 to 20, inclusive. This latter crop was also seeded in field O-IV, plots 1 to 11. The O-III series was utilized for seeding the alfalfa variety test. Eleven one-fourth acre plots are devoted to this test, the varieties used being Grimm, Ladak, Common, Cossack, and Baltic. Each crop is grown in duplicate except Grimm which is triplicated.

Station visitors during the week included J. C. Taylor, Director of Extension of the Montana State College, and R. M. McKee, County Extension Agent for Yellowstone County.

Dan Hansen.

Newlands

The following meteorological data were recorded at this station for the two-week period ending April 27: Mean maximum 65.1, maximum 78 on the 16th; mean minimum 31.8, minimum 25 on the 15th and 25th. There was .16 of an inch of precipitation for the period, .11 of an inch of the total falling on the 22d.

The field work during this period has consisted of hauling sand from north of C-11, 12, 13 to raise these three plots to the level of the remaining plots of the C series. Wheat was planted on A-3 and sweet clover was planted in the rye on B-2, B-3, and B-4. One general irrigation has been given, all plots being irrigated.

Newlands (cont'd)

Some plantings of peas, turnips, carrots, parsnips, radishes, onions, corn, beets, spinach, and melons have been made in the garden. Variety tests are being conducted on peas and onions. The same varieties that were used last year are being tested further this year.

The potato plantings have been made. The test this year has been called "A source of origin" test. The Extension Division of the University of Nevada, through Mr. Thos. Buckman, requested that we conduct a comparison test on the seed potatoes grown in different localities in the State. They sent us potatoes from three different growers within the State and two without the State--one from Idaho and the other from Oregon. These potatoes were given the corrosive sublimate treatment and were planted on a uniform soil in the garden site.

During the run of the irrigation water the two gypsum machines were operated for the first time this year. The following table gives the results of these runs.

	Y machine	H machine
Date of run	April 22	April 22
Length of run (hrs.)	4	2
Head of water (feet)	.45	.20
Flow of water (second-feet)	6.00	6.30
Gypsum put in (lbs.)	1,656	1,104
Gypsum in solutions (lbs.) ..	1,405	948
Gypsum in solution (%)	85	86
r Ca in composite	3.01	3.62
K of composite (x 10^{-5})	59.8	65.5
r Ca above machine	1.17	1.17
K of water above machine(x 10^{-5})	29.3	29.3
Area treated (acres)	6.3	2.1

E. W. Knight.

Prosser

Report for April.

The frost hazard to fruit in the Yakima Valley during the month of April makes gamblers of the fruit growers.

The minimum temperature for the month of April was 22 degrees. There were nine days with a temperature below freezing. Fortunately, however, the fruit is so backward this year that little damage has been done except to cherries, which are probably reduced about 50 per cent. Many fruit growers are now equipped to smudge to prevent damage from frost. It is estimated that proper smudging will raise the temperature around the trees 10 to 12 degrees.

The monthly evaporation for April amounted to 4.53 inches, and the total precipitation was .11 of an inch.

Experimental work during this period has consisted chiefly of seeding plots to the various crops used in the experiments, measuring the water applied to the plots, installing and repairing measuring devices, and keeping records on quantitative water measurements of a number of fields on the farm.

Prosser (cont'd)

Monthly samples were taken of the underground and drainage water from two sets of test-wells near Grandview, and conductance readings were made on them.

President E. O. Holland and Dean E. C. Johnson, of the State College, visited the station on April 29.

C. C. Wright.

San Antonio

The weather of the week ending April 20 has been favorable for the growth of all crops. The moisture supply has been ample so that corn and sorghums have made rapid progress and small grains are fully headed. Conditions have been favorable for rust infection and considerable damage has been done to some plots of oats in the rotations and in the variety test. Wheat and barley have been attacked much less severely than the oats.

The meteorological data recorded were as follows: Maximum temperature 87, mean maximum 82.3; minimum 51, mean minimum 59.9; mean 71.1; greatest daily range 34 degrees. There were three cloudy days, three partly cloudy, and one clear day during the week. The precipitation recorded was .01 of an inch.

Field work was possible the entire week. Cotton plots in the rotations were disked, harrowed, and planted. Plots to be planted to cotton in the cotton-fallow experiment on field C-5, field C-6, and field C-4 were all disked in preparation for planting. Milo plots in the rotations were cultivated and part were hand-weeded. The sorghum variety test was cultivated and hand-weeded. The corn variety test was thinned. Hand work consisted principally of chopping Johnson grass and other weeds in the fields and orchards. Soil samples were taken on the cotton rotation plots at the time of planting.

Mr. S. H. Hastings, Senior Agronomist of the Office of Western Irrigation Agriculture, spent April 17 and 18 at the station. Dr. D. C. Neal, Senior Pathologist, Office of Cotton, Rubber, and Other Tropical Plants, arrived April 19 for conferences and the study of greenhouse and field experiments in connection with cotton rootrot investigations.

The meteorological data recorded for the week ending April 27 were as follows: Maximum temperature 93, mean maximum 83.1; minimum temperature 53, mean minimum 58.7; mean 70.9; greatest daily range 40; precipitation .02 of an inch. There were four cloudy days, two partly cloudy, and one clear day during the week. The weather during the past week has been favorable for the growth of all crops. Although the planting of cotton has been delayed in this section, the most of it is now planted. Johnson grass meadows are being cut for the first crop of hay. Small grains are ripening, and a few fields of oats, north of San Antonio, are being harvested.

Field work during the past week consisted of disking, harrowing, and planting cotton on field A-3, cotton plots in the cotton-fallow experiment on field C-5, the cooperative series on field F-3, and Kekchi selections and increase progenies on the Herbst tract; disking field C-4, cultivating all row crops in the rotations, and the corn varieties. Oats

San Antonio (cont'd)

plots scheduled to be cut for hay were mowed. Although the grain was not quite far enough advanced for the best quality of hay, rust was causing such rapid deterioration that it was thought best to harvest the plots.

Hand laborers were busy all week weeding rotation plots, corn varieties, sorghum varieties, and orchards. Other work consisted of care of grounds and garden, whitewashing the greenhouse, and miscellaneous small jobs.

Mr. H. C. McNamara, Associate Agronomist, U. S. Cotton Breeding Station, Greenville, Texas, was at the station April 22 and 23 directing the planting of the cooperative series of cotton on field F-3 and the Kekchi selections and increase progenies on the Herbst tract. Dr. O. F. Cook, Principal Botanist in Charge, and Mr. W. H. Jenkins, Assistant Agronomist, Office of Cotton, Rubber, and Other Tropical Plants, visited the station April 22.

I. M. Atkins.

Scotts Bluff

The average maximum temperature for the week ending April 27 was 50, with a maximum of 62 on the 27th; the average minimum temperature was 33, with a minimum of 27 on the 26th. The precipitation was .92 of an inch.

The following prices prevailed during the week: Alfalfa hay, $10 per ton; corn, $1.70 per hundredweight; barley, $1.30 per hundredweight; potatoes, 40 to 50 cents per hundredweight; butterfat, 48 cents per pound; and eggs, 20 cents per dozen.

During the week considerable moisture fell, which was a great help to the crops. All of the small grain has been seeded in both fields E and K.

James A. Holden.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI | May 4-11, 1929 | No. 10

Belle Fourche

The maximum temperature for the week ending May 4 was 78, minimum 31, and precipitation .62 of an inch.

On May 1 the following varieties of sugar beets were planted in G-VI: Braune, Titus No. 3, Ivanovka, Ramon, Pioneer R. & G., Uladowka, Bielotzerkov, Vierchniatschka, Kallinik, Schreiber Sk. W., Strube, and R. & G. Old type.

During the week Mr. Lewis A. Hurst, of the Bureau of Chemistry and Soils, visited the station in connection with the commercial fertilizer test with sugar beets. Twenty-one different combinations of fertilizer were put on field P. The Utah-Idaho Sugar Company shipped in 40,000 pounds of phosphate fertilizer from the Anaconda Company for planting on the project. Some of the fertilizer was used on G-VI where sugar beets have been grown for the last three years. Part of this ground was manured in the fall of 1928. Tests are being made as to the relative value of manure, sweet clover pastured, and commercial fertilizers.

The work for the week consisted of preparing land for corn, trimming trees and shrubs on the grounds, and general cleaning up.

Beyer Aune.

Huntley

The maximum temperature for the week ending May 4 was 77, minimum 26, and precipitation .23 inch. The precipitation occurred on April 29 and consisted for the most part of hail. No damage to field crops occurred by reason of this hail since emergence of all crops has been unusually slow due to relatively dry seedbeds and continued cool weather. Trees and ornamental shrubbery, which were just beginning to bud, sustained some injury from this hail.

Preparation of beet plots for irrigating "up" was accomplished during the week. It is expected that water will be turned into the main canal early next week.

Mr. Lewis A. Hurst, of the Office of Soil Fertility Investigations, Bureau of Chemistry and Soils, arrived at the station on May 1 and supervised the planting of the cooperative fertilizer experiment with sugar beets, which was made that afternoon in field B-VI.

Unseasonably cool temperatures continued throughout the week ending May 11, the minimum temperature recorded being 17 degrees above zero. The maximum temperature was 63 and precipitation .04 inch. The unusually low minimum temperature resulted in some injury to alfalfa, garden truck, and ornamental plantings.

Water was turned into the main canal on Monday, May 6. Irrigation of beet plots to provide moisture for the germination of this crop was inaugurated during the week. Irrigation of cow and sheep pastures is also well under way.

Huntley (cont'd)

Station visitors during the week included O. E. Reed, Chief of the Bureau of Dairy Industry, and R. R. Graves of the same Bureau.

Dan Hansen.

San Antonio

Report for the week ending May 4.
The meteorological data recorded were as follows:

Week ending	Temperature (° F.)					G. D. R.	Precipitation	Sky (days)		
	Maximum		Minimum							
	Absolute	Mean	Absolute	Mean	Mean			Clear	Partly cloudy	Cloudy
							Inches			
May 4	101	88.9	40	59.3	74.1	50	----	3	3	1
Month of April	93	83.1	51	61.8	72.5	40	2.56	3	14	13

The weather of the past week has been very hard on all crops. On April 29 the norther which struck northern Texas and western Arkansas was felt here in the form of a strong drying wind from the north. This was very destructive to fruit in the vicinity and damaged corn, sorghums, and young cotton by whipping the plants and removing soil moisture. This wind was followed by strong winds from the south and southeast, combined with high temperatures, the latter part of the week causing further losses of soil moisture. Evaporation was high throughout the week, reaching a maximum on May 1 when the evaporation from a free-water surface was .59 inch. It is doubtful whether late planted cotton on the station will emerge until rain is received. Corn and sorghums are beginning to suffer from lack of sufficient moisture, and small grains are ripening prematurely.

Conditions during April were quite favorable for the growth of crops. Precipitation for the month was .72 inch below normal, but this was compensated to some extent by the average rainfall of March. Thunderstorms occurred on April 7, 8, and 10 with hail on the latter date. The mean temperature for April was 72.5°, which is 4.1° above the average for the past 22 years. The maximum temperature for the month was near normal. Wind movement averaged 3.9 miles per hour for the month, and evaporation from a free-water surface totaled 4.537 inches as compared with 4.2 miles per hour and 5.62 inches, average for the past 18 and 22 years, respectively. Corn, sorghums, and small grains made rapid progress during April. Rust infection in the small grains did not gain a foothold until late with the result that damage is considerably below average this season. Cotton planted in April was put in under favorable moisture conditions and has emerged to good stands.

During the past week the remainder of field C-4, and field C-7 were replowed, spring-tooth harrowed, and drag harrowed in preparation for cotton planting. A variety test was planted on C-4 and a cultural test on C-7. These experiments are conducted in cooperation with the Cotton Breeding Station, Greenville, Texas, Office of Cotton, Rubber, and Other Tropical Plants. Oats for hay on rotation plots was harvested

San Antonio (cont'd)

in good condition. Field E-3, which was planted to alfalfa last winter, was clipped to prevent seeding of Johnson grass. The hay crop consists mostly of Johnson grass. The sorghum variety tests on fields C-3 and B-7 were cultivated.

Hand laborers were busy during the week weeding row crops, orchards, and fence rows.

The meteorological data recorded for the week ending May 11 were as follows: Maximum temperature 97, mean maximum 93; minimum 64, mean minimum 70.1; mean 81.6; greatest daily range 27 degrees. The precipitation was .79 inch. One day was clear, five days were partly cloudy, and one day was cloudy during the week.

The weather of the past week has been favorable for field work, although crops are suffering from drouth. No precipitation of agricultural importance has been received since the week ending April 13 until the last day of the week. Drilled sorghums were especially in need of moisture, and wheat and oats varieties ripened somewhat prematurely because of drouth. Cotton in fields C-4, C-6, and C-7 emerged to very uneven, thin stands, but good stands may be expected after the rains.

Field work consisted of removing alley rows from wheat, oats, and barley varieties and harvesting the majority of them. Oats are very light because of rust damage, but the indications are that wheat and barley will produce fair to good yields for this section. The oats plots on field C-5 and the oats-for-grain plots in the rotations were harvested. The corn in the rotation experiments and variety test was cultivated for the last time. Alfalfa and Johnson grass hay from fields C-4 and E-3 was stacked in good condition. The waste land on A-3 and B-3 was mowed and portions useful for hay were saved. Orchard A-1 was cultivated.

Hand work consisted of miscellaneous weeding of fence rows, orchards, and nurseries; laying mulch paper along the palm row in front of the farmstead grounds; shocking small grains; and work on the grounds and garden. Soil samples were taken at time of harvesting rotation oats plots.

Mr. W. R. Walton, Senior Entomologist, Office of Cereal and Forage Insect Investigations, Bureau of Entomology, was a visitor at the station on May 10.

I. M. Atkins.

Yuma

The maximum temperature for the week ending May 4 was 99, minimum 47, and greatest daily range 51. No precipitation was recorded. For the month of April the maximum temperature was 94.5, mean maximum 83.7; minimum 30.5, mean minimum 45.0; mean range 38.5; precipitation, none.

The Weather Bureau station at Yuma reports the temperature for the month of April to be 2.3 degrees below normal; since January 1 it has averaged 2.4 degrees colder than normal. The total rainfall for the year to date is .63 inch. This is the sixteenth consecutive month with subnormal rainfall. The average wind velocity for April was 4.9 miles per hour.

Yuma (cont'd)

The cold and windy weather which prevailed during the cotton planting season has caused a poor stand on most of the project. It is estimated that less than one-third of the acreage is up to a normal stand on May 1. Many fields are being irrigated for replanting. Poor stands were reported from all sections of the project regardless of the types and methods of planting the seed.

The discharge of the Colorado River at Yuma continues to be less than the average run-off for this time of the year. The cold weather in the upper mountainous regions seems to be holding back the normal spring flood. It is reported that the amount of snow on the watershed is about 25 per cent above normal.

Station work performed during the week included the replanting of seven plots of cotton;harvesting barley on the rotations; cleaning ditches; pruning and pollinating date palms; general hoeing and cultivating.

Mr. S. H. Hastings was a station visitor April 29 and 30.

The maximum temperature for the week ending May 11 was 101, minimum 47, and greatest daily range 52. No precipitation was recorded. On six days of the week very little wind movement occurred. A hot wind, however, blew all day on the 11th.

Cotton plantings are now making a rapid growth. The cultivation and thinning of this crop is well under way on most of the project. Cotton is still being planted in some sections where the first stands were plowed up. Barley and wheat crops are being harvested.

Cool weather up the river is still delaying the normal spring flood. The discharge of the Colorado River at Yuma is now about 25,000 second-feet per day. A flow of 47,000 second-feet is expected within a week.

Station work performed during the week included the thinning and cultivating of all cotton plots, repairing and removing fences, and general hoeing and irrigating.

E. A. Zemcuznikov, Professor of Plant Physiology, Don College of Agriculture and Amelioration of Northern Russia, was a station and project visitor on May 7.

E. G. Noble.

W E E K L Y R E P O R T S
Of The Office Of
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Belle Fourche

The maximum temperature for the week ending May 18 was 84, minimum 30, and precipitation .18 inch.

During the week the corn was planted in fields A, G, Maximum Production, variety corn in O, and silage test in field P. The flax varieties were planted in G and the flax plots in A and Maximum Production. Irrigation ditches were completed in fields A, P, O, and W.

The maximum temperature for the week ending May 25 was 93, minimum 29, and precipitation .01 inch.

During the week the alfalfa and sweet clover were irrigated in A. Dr. Buckley, of the Bureau of Animal Industry, visited the station on Monday and vaccinated the spring pigs. At this time there are 43 living pigs from the six sows farrowed.

On May 23 the test of self-fed fall pigs on corn and alfalfa was completed. There were ten pigs in this lot with an average weight of 35.7 pounds at the time of weaning and beginning of the test. The following summary shows approximately the feed required during the gestation and suckling period (March 19 to December 5, 200 days) to produce a pound of weaned pig:

Ground barley	.09 lb.
Ground wheat	2.52 lbs.
Shelled corn	1.75 "
Mangels	2.00 "
Skim-milk	.50 lb.
Alfalfa pasture	123 days

Feed consumed during the feeding period (December 5 to May 22, 168 days).- The pigs were put on self-feeders and fed shelled corn with access to third cutting alfalfa hay in racks. During April and to the end of the feeding period they had access to alfalfa pasture in addition. The average initial weight was 35.7 pounds. During the period of 168 days they consumed 6,737 pounds of shelled corn and 3,685 pounds of alfalfa hay and made a gain in weight of 1,887 pounds of pork, or 3.57 pounds of corn and approximately 2 pounds of alfalfa hay per pound of gain. Figuring shelled corn at $1.60 per hundredweight, ground wheat and ground barley at $1.50 per hundredweight, mangels at $5 per ton, alfalfa hay at $10 per ton, and alfalfa pasture at $20 per acre, the cost per pound of gain at time of weaning was 10 cents and for the feeding period 6.81 cents. Combining the two periods, the cost per pound of gain was 7.32 cents. The hogs were sold at Newell for 9 cents a pound.

Mr. A. C. Cooley visited the station on May 23 and 24.

Beyer Aune.

Huntley

Somewhat warmer weather prevailed during the week ending May 18 than has been heretofore experienced. The maximum temperature recorded was 81, minimum 28, and precipitation .04 inch. While the warmer weather of the past week has been somewhat beneficial, the continued drouth has made it necessary to commence irrigating "up" of crops, the first irrigation of the season for this purpose being given during the week to the beet plots. Alfalfa plots were also irrigated. Grain plots, which were sown at a somewhat greater depth than beets, have germinated in some instances, a fair to good stand resulting.

Beans, potatoes, and corn were sown in the irrigated rotations during the week, this completing the seeding of this experiment.

Hogs were placed on the alfalfa pastures in fields K and L-IV on Friday, May 17.

Dr. S. S. Buckley, of the Animal Husbandry Division of the Bureau of Animal Industry, visited the station on May 18 for the purpose of vaccinating the spring pigs.

The warmest weather of the season to date was experienced during the week ending May 25, the maximum temperature reaching 89 degrees. The minimum temperature was 31. Conditions of drouth continue to prevail, the precipitation recorded during the week amounting to but .02 inch.

Various selections of Great Northern beans were planted in Series III of field L during the week. Plots O-II-6 and 7 were seeded to a number of varieties of beans, including Great Northern, Navy, Pinto, Early Wonder, 1000-1, Early Prolific, Robust, and Great Northern (Idaho certified). Duplicate two-row plots of each variety were used in this experiment. Additional bean varieties were seeded on plots O-II-8 and 9.

Beets in the irrigated rotations and miscellaneous experiments that had previously been irrigated "up" have germinated to good stands.

Mr. D. V. Kopland, who has been assigned to the station in charge of the dairy work, vice T. W. Moseley, arrived on May 20.

Dan Hansen.

San Antonio

During the week ending May 18 rains of great agricultural value have fallen throughout this section and most of the State. Rains of general nature throughout the hill section northwest of San Antonio have raised the level of Medina Lake 8 feet, according to reports. This is the first important rise in the level of the lake in approximately seven years and is of great value to irrigated sections using the water from the lake. A total of 2.27 inches of precipitation was recorded at the station during the week. The larger part of this occurred in two rains, and as very little run-off occurred, it was of great value to crops. Corn was starting to tassel and milo to head at the time of the first rains. Some corn will be produced if no more precipitation is received, while additional precipitation within a week or ten days will practically assure fair to good corn and milo crops. Hay sorghums have made rapid growth the past week, and a good tonnage is assured for the first crop. Small grains on the station were either harvested or too far advanced to benefit by the rains. Cotton on the station, which at first did not emerge uniformly due to dry seedbeds, has all emerged and although variable in size

San Antonio (cont'd)

will permit thinning to very good stands. Following the first rain of May 11, cool, cloudy weather has persisted. This has not been especially favorable for the growth of corn and cotton.

The following meteorological data were recorded: Maximum temperature 88, mean maximum 84; minimum 62, mean minimum 66; mean 75; greatest daily range 26 degrees. No day was entirely clear during the week; four days were partly cloudy and three were cloudy. The precipitation was 2.27 inches.

Field work has consisted of harvesting the latest varieties of small grains in the variety test, and oats on field BC-3; plowing, preparing seedbed, and planting Sudan grass in the pasture at the Farm residence; disking orchard B-3; and spraying grapes. Hoe laborers were busy weeding rotation plots and general fields when weather permitted. During the rainy weather clipping mules, miscellaneous repair of buildings and machinery, and care of the grounds occupied the time.

The rainy weather reported last week has continued throughout the week ending May 25 until more than sufficient rainfall for present crop needs has fallen and a period of dry, clear weather would be welcome. Precipitation for the past week was 3.77 inches, which combined with the rainfall of the previous two weeks brings the total for the month to date to 6.83 inches, the highest rainfall ever recorded at the station for the month of May. The mean rainfall for May for the past 22 years is 2.98 inches. The weather has been favorable for the growth of feed crops, but has been too wet and cool for the best growth of cotton and corn. Much difficulty is anticipated in keeping weeds in check as a result of the excessive rains. The mean temperature of the past week was 71.1° F., which is 4.3 degrees below the mean temperature for May for the period 1907 to 1928, inclusive.

The following meteorological data were recorded: Maximum temperature 88, mean maximum 81.7; minimum 55, mean minimum 60.4; mean 71.1; greatest daily range 25 degrees; precipitation 3.77 inches. There were two clear, two partly cloudy, and three cloudy days during the week.

Field work was possible the first three days of the week. The flax variety test and the first two plantings in the date-of-seeding flax test were harvested. The sorghum variety test and the row sorghums in the rotations were cultivated. Sudan grass planted on A6-18 in the rotations made poor growth and was not able to compete with the weeds. This plot was mowed and the weeds removed; then it was plowed and replanted to Sudan grass. May plowing in the rotations following oats for hay was completed. Fallow plots on field A-4 were disked for weed control as were also the alleys between the plots in the rotations.

Hoe laborers were busy when weather permitted weeding cotton. Miscellaneous repair work about the buildings and machinery occupied the time when field work was impossible.

Messrs. P. R. Dawson, Associate Biochemist, and H. V. Jordan, Associate Soil Technologist, visited the station May 21 and 22 to set plot stakes and study the growth of cotton in their experiments on rootrot control.

I. M. Atkins.

Umatilla

The weather during the period from May 1 to 18 was dry and somewhat windy. The minimum temperatures were dangerously near to freezing a number of times. The maximum temperature was 86, the minimum 32, and the precipitation amounted to .26 inch.

The Office of Horticultural Crops and Diseases is continuing the work started last year on the curly-top project with major attention to vegetable crops. This year over 400 varieties and strains will be tested for resistance to the disease. R. F. Wilbur, an agent of the Office, who handled the work last year, will be in direct charge again. A glass house 9 x 12 feet has been erected for a breeding house for the insects carrying the disease. All the different kinds of vegetables will be grown in a cloth-covered cage 30 x 40 feet long and 7 feet high. This will keep them away from the possibility of natural infection, so that symptoms on inoculated plants may be checked against normal growth. Most of the time recently has been spent in getting this work started.

The alfalfa in the reestablishing-of-alfalfa tests, seeded last year with very good stands, is growing vigorously and promises to give good yields, which is contrary to the general opinion locally that reseeded alfalfa never gives satisfactory results.

The Umatilla Project Farm Bureau has recently started a movement to have the construction charge entirely written off or else have the whole project placed in class 5, temporarily non-agricultural. A committee appointed to present the matter to the Interior Department has had a number of meetings to decide the best means to pursue. The movement appears to have strong backing.

Mr. D. E. Stephens, Superintendent of the Moro (Oregon) Station, was a visitor.

The weather during the early part of the week ending May 25 was very warm, but cooler and very windy days followed. The maximum temperature was 94, the minimum 37, and there was no precipitation. The wind on Friday did more real damage to growing crops than any we have had for a long time. Many of the vegetables in the curly-top tests which had just come through the ground were completely cut off by the drifting sand. All the watermelons, cucumbers, and cantalcupes will have to be replanted.

M. B. McKay, Plant Pathologist, Oregon Experiment Station, spent Wednesday here outlining the pathological phases of the curly-top vegetable tests. He brought an initial supply of leaf hoppers, and a number of plants in the plant house were inoculated.

Labor was employed at irrigating and weeding.

H. K. Dean.

Yuma

The temperatures for the week ending May 18 were as follows: Maximum 102, minimum 47, greatest daily range 52. Although there were slight showers on May 15 and 16 in other sections of the Yuma Valley, none occurred at this station.

The warmer weather that is prevailing at the sources of the Colorado River has caused the daily discharge at Yuma to go up to 43,000 second-feet. This is an increase of 18,000 second-feet since May 10. It is

Yuma (cont'd)

predicted that by May 27 75,000 acre-feet will flow past Yuma daily, with a steady rise thereafter.

There seems to be a good stand of the second planting of cotton in the Yuma Valley and it is growing rapidly. Some of the early cotton has been irrigated.

Most of the barley plots in the rotations have been cut and many have been threshed. Those that have been threshed are now being plowed and will be succeeded mainly by sorghums. The second crop of hay, which is now being cut, seems to indicate larger yields than was obtained in the previous cutting.

Arthur T. Bartel.

The maximum temperature for the week ending May 25 was 102, minimum 47, and greatest daily range 52. No precipitation was recorded.

With only light winds, the weather for the past seven days has been very favorable for the young cotton. On the early plantings the squares are beginning to appear.

Numerous reports have been received regarding aphis injury to the alfalfa hay crop. In some cases the fields were cut for hay instead of allowing it to carry through for a seed crop. Superphosphate at the rate of 300 pounds per acre is being used to a large extent this year on those sections of the project where the soil is of a light, sandy texture. Alfalfa hay prices are ranging from $12 per ton loose in the field to $16 baled and on board cars at Yuma.

The Colorado River continues to rise with a gauge reading at the end of the week of 25 feet at Yuma. The discharge is estimated to be about 60,000 second-feet. A continual rise is predicted from up-river reports.

All barley and wheat plots on the station have been cut. The threshing of these plots is about half completed. The second cutting of alfalfa hay has been put up. The cotton plots have been cultivated for the fourth time. Other station work included the plowing and manuring of barley stubble plots to be planted to grain sorghums, pollinating and pruning date palms, hoeing cotton plots, cleaning ditches, and repairing irrigation structures.

E. G. Noble.

M I S C E L L A N E O U S

BORON SURVEY OF THE BAKERSFIELD AREA, CALIFORNIA

Introduction

In December 1928 Dr. A. R. C. Haas, of the Citrus Experiment Station at Riverside, California, reported verbally that he had observed symptoms of boron injury on some orange trees on a ranch near the Weed Patch store southeast of Bakersfield, California. Early in February of the present year, the writer, in company with Mr. L. W. Taylor, Farm Advisor of Kern County, examined these orange trees, obtained a leaf sample for analysis, and also a sample of the well water said to have been used in irrigating them. The analysis of the leaf sample (L-120) showed a boron content of 558 parts per million of elemental boron referenced to the dry weight of the material. The water sample (No. 625) contained 60 parts per 100 million of boron. Another sample of orange leaves (L-121) from a grove near Edison, California, showed severe leaf injury and was found to contain 628 parts per million of boron. No sample could then be obtained of the irrigation water used on the Edison grove, but samples from wells in that neighborhood (Nos. 626 and 627) contained only 27 and 18 parts per 100 million, which is believed to be too low to cause injury even to lemons. Another sample of water from the well at the United States Field Station at Shafter, northwest of Bakersfield, contained only 14 parts per 100 million of boron. The evidence obtained on this first visit to Bakersfield did not indicate the general occurrence in that region of harmful quantities of boron in the irrigation water.

At about this time Mr. W. S. Ballard reported verbally that irrigation water from a certain well located at the northwest corner of section 17, T. 31 S., R. 30 E. (Mt. Diablo base line), had shown injurious effects when used on grapes and apricots. Mr. Ballard had suspected that boron was the cause of the observed injury but had not demonstrated it. Arrangements were made, through the courtesy of Mr. Richard Schmidt and the Valley Farms Company, who own the well in section 17, to obtain a sample of its water. This sample, taken on February 26 (No. 684), was found to contain 176 parts per 100 million of boron. Since this boron content is regarded as rather high for irrigation water, and since the total salt content was low ($K = 58.7 \times 10^{-5}$ at 25° C.), it seemed desirable to make a further study of conditions east of the Weed Patch and including the area around section 17, which is six miles east. This was done on April 5 and 6, 1929.

The First Survey

In this survey of April 5 and 6 the writer was assisted by Messrs. Ballard and Schmidt and by Mr. Charles Rayburn, of the Earl Fruit Company. Mr. Rayburn had observed evidences of injury to grapes and apricots from the use of water from a well located at the northeast corner of section 13-31-29, or one mile west of the well in section 17-31-30, sampled on February 26 (No. 684). In the case of grapes the injury occurred in the leaves as a constriction of the margins accompanied by discoloration and death of the marginal tissue. With apricots the leaf injury was described as a constriction of the margins without pronounced discoloration,

Boron Survey of the Bakersfield Area (cont'd)

but the leaves became cup-shaped. With both these species the injury is said to be reflected in reduced crop yields.

On this occasion 12 samples of water were collected. Ten of these were from wells in the vicinity of the Rock Pile School, which is adjacent to the well at the northwest corner of section 17 above referred to. In addition two samples were taken from a spring and a small reservoir supplied from the spring, both located near the southwest corner of section 3-31-30, inside the pasture of El Tejon ranch.

These samples (Nos. 804 to 815) were subsequently analyzed, and it was found that the boron content of the waters ranged from 33 to 736 parts per 100 million. The two samples from El Tejon spring contained 690 and 736 parts per 100 million. A well on the Neumarkel ranch at the southeast corner of section 20-30-30 contained 666 parts per 100 million. The well at the northeast corner of section 13-31-29 contained 451 parts, while a well located near the center of the north line of section 18-31-30 contained 464 parts per 100 million. These two wells are in line with and west of the well at the Rock Pile school. A sample from a well at the center of section 17-31-30 contained 96 parts per 100 million, while a well located near the center of the west line of section 13-31-29 contained 194 parts per 100 million of boron. A number of other wells in this general neighborhood showed much less boron, indicating that the occurrence of this element is not uniform in the underground water of the area.

At the time this first survey was made (April 5 and 6) there was little in the way of striking evidence of boron injury to the orchard crops. Near the well at the center of the north line of section 18 (water sample No. 808) there was a red gum tree on which the leaves showed some injury in the way of dead areas along the margins. A sample of these leaves taken for analysis showed a boron content of 1000 parts per million. At the Neumarkel place, section 20-30-30 (water sample 810), the evidence of boron injury was very pronounced. On this ranch there was only a limited water supply, the ranch being a dry farm. Irrigation was used on a tract of about an acre that had been planted with a number of fruit trees for domestic use and some ornamentals. Of these trees only the olives and one species of grape, said to be a native species, had escaped serious injury. Several kinds of citrus, a number of deciduous fruits, figs, oleanders, and eucalyptus were either dead or badly injured. The water had been used since 1924 and was satisfactory for domestic use. An analysis that had been made to determine the ordinary salt constituents had not revealed the cause of its injurious effects on plants. Two small orange trees that were still living were entirely defoliated, though new leaves were starting out. Some of last year's leaves found on the ground showed characteristic boron injury.

The field observations of this survey indicated the probability that there was boron injury in this area, though the evidence was not conclusive. The subsequent analysis of the water samples collected at that time made it clear that boron was an important factor in the situation, but it remained to determine the source of this boron and the limits of its occurrence in the higher concentrations.

Boron Survey of the Bakersfield Area (cont'd)

		R. 29 E.				R. 30 E.		
					18	17 x 82	16	
21	22	23	24	19	20	21 x 666	22	
28	27	26	25	30	29	28	27	
33	x 43 34	35	36	31	32	x 751 33	34	
		T. 30 S.						
	x 20	T. 31 S.				x 712		
4	3	2	7	6 x 31	5	4	3 x 690	
				54	33		x 736	
	x 40			x 26	x 33 x x			
9	10	x 61 11	12	7	8	x 724 9	10	
16	15	x 49 14	x 151 x 194 13	x 443 457 x 161	x 464 18 x 31	x 352 17 x 94	16	15
21	22	23 Arvin	24	19	20	21	22	
28	27	26	25	30	29	28	27	
33	34	35	x 12 36	x 16 x 18 31	32	33	34	

Boron content of underground water east of Bakersfield, California, April, 1929, expressed as parts per 100 million.

Boron Survey of the Bakersfield Area (cont'd)

The Second Survey

Soon after the analyses of the samples from the first survey were completed, another visit was made to the Bakersfield area. This was on April 33 to 26. On this occasion again Mr. Rayburn cooperated in the survey. A study of local maps and of such information as was available concerning the underground waters of the area had previously been made.

The arable land of the Bakersfield area lies in a smooth plain sloping to the southwest. It is essentially the delta cone of Kern River. The deep gravels of this delta cone carry water largely derived from percolation that takes place freely from the river after it emerges from hills a short distance northeast of Bakersfield. About 20 miles east of Bakersfield, Caliente Creek discharges into the edge of this same delta cone. Caliente Creek and its chief tributary, Tehachapi Creek, are small streams except when in flood and probably do not contribute much water to the underground supply.

It seemed possible that the boron found in some of the wells near the eastern edge of this delta cone might have come from the drainage basin of Caliente Creek. It was noted that while the elevation of the underground water in the vicinity of the Rock Pile school is about 350 feet above sea level (the ground surface is about 500 feet), the water at El Tejon spring and in the Neumarkel well stood at more than 600 feet elevation. These waters, both high in boron, appear to represent a perched water-table that is held back by some underground barrier from joining freely the main body of underground water immediately to the west and 300 feet lower.

In order to determine whether or not the boron in this perched water-table is derived from the Caliente drainage basin, a sample of Tehachapi Creek was taken from the surface flow at a point near Keene. Another sample was taken from Caliente Creek at a point about one mile above the station of Caliente where the two creeks join. These samples, No. 926 from Tehachapi Creek and No. 928 from Caliente Creek, contained, respectively, 25 and 87 parts per 100 million of boron. Obviously the surface waters in these two creeks do not contain enough boron to account for the concentration of that element found in the perched water-table east of the Kern River delta cone.

At the time the samples were taken there was no surface water flowing on the delta cone of Caliente Creek. It was possible, however, to obtain a sample of the underground water at the apex of this cone. A well was found at the center of section 17-30-30 in the flood channel of Caliente Creek. Water from this well (sample No. 944) contained 82 parts per 100 million of boron. The water in this well stood at 636 feet above sea level or at approximately the same elevation as in the Neumarkel well, which is located at the southeast corner of section 20-33-30 and which contained 666 parts per 100 million of boron. From these relative levels it is conceivable that the perched water-table tapped by the Neumarkel well and El Tejon spring may be fed from the underflow of Caliente Creek, but the much higher boron content found in these waters indicates that the boron must originate elsewhere than in the main Caliente drainage.

In connection with this second survey, 24 samples of water were taken for the quantitative determination of boron. Three of these (Nos. 926, 928, and 944) represent Caliente drainage with boron contents of 25, 87, and 82 parts per 100 million, respectively. One additional sample

Boron Survey of the Bakersfield Area (cont'd)

was obtained from the perched water-table east of the Kern delta cone. This was from a shallow well located near the northeast corner of section 33-30-30 where the water stood at an elevation of 717 feet. The boron content of this sample (No. 943) was 751 parts per 100 million, or closely similar to the findings for the Neumarkel well and El Tejon spring. One sample was taken from Kern River at the heading of the main east side canal. This contained 35 parts per 100 million (sample No. 952). Two samples were obtained from wells above the delta cone north of Caliente Creek. These samples (Nos. 945 and 946) were both very low in boron, 28 and 21 parts per 100 million. The remaining 18 samples were taken from wells near the eastern edge of the Kern River delta cone where the elevation of the surface of the underground water is 350 to 375 feet above sea level. These waters were all low in total salts but differed greatly in boron content.

In order to bring out the salient features of the water situation as developed by this second survey, it is desirable to group the waters into classes. This classification takes into account not only the boron content, but also the ratios of the other ions that were identified by analysis. These ions include: (1) The weak acids, carbonate and bicarbonate; (2) chloride; (3) sulphate; and (4) the alkaline-earth bases, calcium and magnesium. These ions expressed in terms of their reacting values together with the total salt content expressed as specific conductance ($K \times 10^{-5}$ at 25° C.)and the boron content expressed as parts per 100 million of elemental boron constitute the full description of a water sample and permit comparisons with respect to quantity and character of the salt content.

The first group to be considered includes the two samples from Caliente and Tehachapi Creeks' surface flow (Table 1). These two samples are similar in quality, being high in sulphate and in alkaline-earth bases. In comparison with them the sample of underground water from the apex of the delta cone of Caliente Creek in section 17 is very different (Table 2). In this sample the salt content is low; the boron content is only slightly higher than the mean of the other two; the proportion of alkaline-earth bases is very low; and of the acid ions the bicarbonate is by far the most important. The inference is that the water reaching the deep gravels in this delta cone are largely storm waters coming as floods that pick up very little salt as they come down.

Table 1.- The quality of the water in the drainage basin of Caliente Creek, California.

Lab. No.	Location	K	B	Reacting values			
				CO_3+HCO_3	Cl	SO_4	Ca+Mg
926	Keene	113.1	25	5.11	1.65	5.31	8.80
928	Caliente	134.0	87	5.69	1.92	7.33	10.64
Mean		123.5	56	5.40	1.78	6.32	9.72
Per cent		---	--	40	13	47	72

Boron Survey of the Bakersfield Area (cont'd)

Table 2.- The quality of the water from the apex of the delta cone of Caliente Creek, center of section 17-30-30.

Lab. No.	Location	K	B	Reacting values CO_3+HCO_3	Cl	SO_4	Ca+Mg
944	Caliente Cr.	47	82	4.01	.65	.02	.20
	Per cent	--	--	85	14	1	4

The next group of waters represent the perched water-table east of the delta cone. They include the Neumarkel well in section 20-30-30, the shallow well in section 33-30-30, two samples from El Tejon spring and reservoir near the southwest corner of section 3-31-30, and a well located near the center of the east line of section 8-31-30. The elevation of the water in this well is not known, so it is not certain that this sample represents the perched water-table; but the quality of the water indicates that it does (Table 3). These waters while low in total salts are very high in boron. The chloride content is high as compared with the sulphates, and the proportion of alkaline-earth bases is very low.

Table 3.- The quality of the water in the perched water-table east of the Kern River delta cone.

Lab. No.	Location	K	B	Reacting values CO_3+HCO_3	Cl	SO_4	Ca+Mg
810	Neumarkel	81.6	666	2.39	2.53	2.63	.31
943	Section 33-30-30	53.8	751	3.36	1.70	.24	.44
811	El Tejon spring	46.0	690	2.23	1.54	.49	.15
812	El Tejon reservoir	46.9	736	2.15	1.53	.67	.10
942	Section 8-31-30	46.9	724	2.17	1.80	.40	.57
Mean		55.0	713	2.26	1.82	.89	.31
Per cent		----	---	45	37	18	6

The deeper waters that occur under the eastern edge of the Kern River delta cone and south of the delta of Caliente Creek may properly be grouped into two classes. While these two classes are not sharply divided and differ from each other less than they differ from the classes previously set up, they do show significant characteristics. One group may be referred to as the contaminated waters, by which is meant that they show a relatively high boron content, probably derived by leakage from the perched water lying above and to the eastward. The other group includes the surrounding wells in which the boron content is lower. The characteristics of the first group are shown in Table 4.

The eight samples listed in Table 4 represent seven wells, Nos. 805 and 938 being from the same well but taken at different times, the first one on April 5 and the second on April 24.

Boron Survey of the Bakersfield Area (cont'd)

Table 4.- The quality of the water in the wells classed as "contaminated" near the eastern edge of the delta cone of Kern River, Calif.

Lab. No.	Location	K	B	Reacting values $CO_3 + HCO_3$	Cl	SO_4	Ca+Mg
934	Section 17-31-30	51.2	352	2.80	1.40	.42	2.34
808	" 18-31-30	41.3	464	2.54	1.27	.34	1.39
805	" 13-31-29	78.5	451	2.26	1.98	1.14	2.68
938	" 13-31-29	55.0	443	2.50	1.50	.63	1.53
941	" 14-31-29	101.0	151	5.25	2.11	2.13	5.77
815	" 13-31-29	61.0	194	2.94	1.38	.75	2.73
940	" 13-31-29	51.1	161	3.60	1.10	.20	1.82
807	" 17-31-30	41.6	96	2.73	.88	.50	1.09
Mean		60.1	289	3.08	1.45	.76	2.42
Per cent		----	---	58	28	14	46

The first four wells listed, that is, the first five samples in the table, are located on an east to west line two miles long, extending from the northwest corner of section 17-31-30 to the northeast corner of section 14-31-29. The last three samples listed in the table are from wells located on a line running from west to east 2½ miles long and ½ mile south of the line described above. To be more specific, No. 815 is from a well near the center of the west line of section 13-31-29, No. 940 from a well 3/4 mile east of No. 815, and No. 807 is from a well in the center of section 17-31-30. From these results it appears that the area of high-boron water is less than a mile wide and less than 3 miles long. However, there are two facts to be noted in this connection. A sample of water (No. 939, see Table 5) was obtained from a well on the line between Nos. 940 and 807, i.e., ¼ mile east of the center of section 18-31-30, in which the boron content was only 31 parts per 100 million. This indicates that the high-boron water is not continuous along the south side of the area. Also it should be noted there are two other wells northeast of this area that showed a high boron content. One of these (No. 942 in Table 3) is located one mile east and ½ mile north of No. 934, i.e., near the center of the east line of section 8-31-30. The water from this well contained 724 parts per 100 million of boron. The other high-boron well is 1½ miles north of the one last mentioned or at the northwest corner of section 4-31-30. This well in section 4 had been abandoned. The water was 250 feet below the surface of the ground, and owing to obstructions in the pipe it was difficult to obtain a full-sized sample. Only about two quarts of water was obtained and all of it was used in the boron determination, so the other analyses could not be made and the sample is not listed in these tables. The boron content was 712 parts per 100 million.

The approximate limits of the area of high-boron underground water were established by finding that wells to the north, to the west, and to the south of that area contained very little boron. Four wells along the line north of section 7-31-30, only one mile north of the line of high-boron wells, showed only a normal boron content. Three wells along the west line of sections 11 and 14-31-29 were also low in boron though only one mile west of the wells represented by sample Nos. 941 and 815(Table 4).

Boron Survey of the Bakersfield Area (cont'd)

On the south the border line has not yet been so well established. It was noted above that one of the wells (No. 939) only half a mile south of the line of high-boron wells showed a low boron content. The only other wells south of the area that were sampled are three located in section 36-31-29, three miles south of the line of the high-boron wells. It still remains to establish the southern limit of boron contamination by sampling wells east and north of Arvin in sections 23 and 24-31-29 and sections 19 and 20-31-30.

The analytical results for the samples from the wells just outside the high-boron area are given in Table 5. The first four samples listed in the table are from wells along the north line of section 7-31-30, one mile north of the high-boron wells. The next sample in the table is from a well in the center of section 6-31-30 or ½ mile further north. These waters are all very much alike and indicate very little boron contamination. The next two samples, Nos. 930 and 931, are from the east line of section 33-30-29, about 4 miles north and west of the area represented by the first five samples. For one of these samples only the conductance and the boron were determined, as the container was accidentally broken in the laboratory and the sample was lost. The next three samples, Nos. 948, 949, and 813, are from wells on a north to south line between sections 10 and 11-31-29 or one mile directly west of the area of high-boron.

Table 5.- The quality of the water in wells just outside the high-boron area east of Bakersfield, California.

Lab. No.	Location	K	B	Reacting values CO_3+HCO_3	Cl	SO_4	Ca+Mg
804	Section 7-31-30	63.0	33	4.39	.71	1.44	4.54
814	" 7-31-30	66.4	54	4.09	.82	1.65	4.63
933	" 7-31-30	64.0	33	4.42	.79	1.64	5.19
932	" 12-31-29	65.2	26	3.90	.80	1.50	4.82
947	" 6-31-30	64.7	31	4.30	.90	1.62	4.38
930	" 33-30-29	62.8	43	----	---	----	----
931	" 4-31-29	66.6	20	4.15	.86	1.35	4.45
948	" 10-31-29	63.2	40	4.50	.90	1.43	4.09
949	" 10-31-29	63.5	61	3.80	1.00	1.59	3.50
813	" 15-31-29	52.5	49	3.23	.74	1.16	2.66
939	" 18-31-29	49.0	31	3.30	.90	.39	1.90
935	" 36-31-29	51.0	12	2.82	1.15	.72	2.83
936	" 36-31-29	34.8	16	2.70	.40	.36	1.50
937	" 36-31-29	104.0	18	3.10	3.20	3.17	5.87
Mean		62.1	33	3.75	1.01	1.39	3.88
Per cent		----	--	61	16	23	63

Sample No. 939 is from section 18-31-30, only ½ mile south of the high-boron wells Nos. 934 and 808 (Table 4). This sample by its low sulphate content and low alkaline-earth bases appears to be related to the high-boron waters except in its boron content. The last three samples listed in the table are from section 36-31-29, three miles south of the high-boron wells. These samples are very low in boron, but from the conductance and the proportions of the other ions they do not appear to be

Boron Survey of the Bakersfield Area (cont'd)

closely related to the other samples in the table or to each other. Probably some of the underground water at the southeast edge of the delta cone is in part derived from the adjacent hills.

Miscellaneous Water Samples

In connection with the attempt to locate the source and the limits of the high-boron water in the areas east of Bakersfield, a number of water samples were taken at other places on the Kern River delta cone. The locations of these samples and the analytical results are included in the present statement for purposes of record.

On February 5 a sample was taken from the older well at the U. S. Field Station two miles north of Shafter, No. 624, Table 6. Sample No. 625 was taken on February 6 from a well in section 18-31-29 about ½ mile south and east of the Weed Patch store. This water had been used on a few orange trees, which showed some symptoms of boron injury and a high-boron content (see next chapter, L-120). Sample No. 626 is from a domestic well at the ranch headquarters of the Edison Company at Edison, California, about 8 miles east of Bakersfield. Sample No. 627 is from the Crane well at Magunden. The water from this well was said to have injured a block of peaches on which it was used. If this is true, the injury was probably due to the high chloride content of the water rather than to the boron.

On February 26 a sample of water was taken from the well at the northwest corner of section 17-31-30, the same well that is reported as No. 934 (Table 4). This sample, No. 684 and No. 809, which was taken from the same well on April 5, may be seen to differ not only in boron content but in other respects also from the sample taken on April 26. These differences call for a word of explanation. It was found that this well is connected to a pipe line that is also connected with another well located a mile north (No. 804, Table 5). This latter well is on higher ground than the well in section 17 and is used more frequently, partly because its water is believed to be of better quality.

Table 6.- The quality of the water from miscellaneous wells in the vicinity of Bakersfield, California.

Lab. No.	Location	K	B	Reacting values CO_3+HCO_3	Cl	SO_4	Ca+Mg
624	Shafter	49.5	14	3.50	.30	.69	3.96
625	Section 18-31-29	91.1	60	5.70	1.20	2.97	2.92
626	Edison	67.6	27	4.00	1.05	1.18	4.14
627	Magunden	177.0	18	1.75	8.40	6.23	11.28
684	Section 17-31-30	58.7	176	3.60	.95	1.10	3.01
809	" 17-31-30	61.5	61	4.33	.73	1.49	4.22
806	" 20-31-29	53.2	62	2.69	1.02	1.21	2.40

When the samples of February 26 and April 5 were taken, the well in section 17 was started up and run for only a short time. It seems probable that the samples thus obtained represented only in part the underground water tapped by this well, the remainder being water from

Boron Survey of the Bakersfield Area (cont'd)

the other well that had leaked in from the connecting pipe line. When the sample of April 26 (No. 934) was taken, the well had been running for six hours; and it is believed this sample better represents the underground water at this location.

Sample No. 806 is from a well at the northeast corner of section 20-31-30. This is in the same neighborhood as No. 625 and shows approximately the same boron content, though the salt content is slightly lower. It is adjacent to the main canal that carries gravity water from Kern River.

Leaf and Soil Samples

On the first visit to the Bakersfield area on February 6, 1929, two samples of orange leaves were taken for boron determination. One of these, L-120, was from the oranges growing in section 18-31-29 near the Weed Patch store. The boron content of this sample was 558 parts per million referenced to the dry weight of the leaf material. The other sample was taken from an orange grove near Edison and contained 628 parts per million of boron. In both cases there were characteristic though not pronounced symptoms of boron injury.

On April 6 a sample of Eucalyptus leaves (red gum) was taken from a tree growing near the well from which water sample No. 808 was taken (Table 4). These leaves showed severe injury in the form of dead, brown areas. The boron content was 1000 parts per million. On April 26 at El Tejon spring it was found that a large Malva was the most conspicuous plant growing in the moist soil around the spring. These plants were 4 to 5 feet high and showed no injury except that the leaf petioles and the bracts of the involucre were dark red. The boron content of the leaf and stem material was found to be 207 parts per million. In the pasture below the spring the only shrub was a species of Artemesia, the leaves of which had yellow areas along the margins. A sample of the leaves and soft stems showed 142 parts per million of boron.

Three samples of soil were taken at the time of the second survey, April 25. The first of these, S-23, represents the upper 6 inches in an abandoned grape planting near the center of the north line of section 17-31-30. This soil is a light, friable sandy loam and had been irrigated chiefly from the well at the northwest corner of that section (water sample 934, Table 4). The effect of using this water had been so injurious that irrigation had been abandoned. The second sample, S-24, represents the zone 4" to 12" in the garden of the Neumarkel ranch at the southeast corner of section 20-30-30. This garden had been watered since 1924 from the well represented by water sample 810 (Table 3). The soil is a gravelly loam. The use of that irrigation water had proved to be very injurious to many different species of plants and fatal to some, including citrus. It has not been injurious to olives and to a native species of grape. The third sample, S-25, represents the upper 4 inches of soil below the reservoir at El Tejon spring, section 3-31-30. This soil was supporting a species of Carex and one of Hordeum. It was a silt loam of high water-holding capacity, and since it was located close to one of the overflow channels from the reservoir was thought to represent a high concentration of boron. The plant growth in this soil was not very vigorous, but the plants did not show definite symptoms of injury.

Boron Survey of the Bakersfield Area (cont'd)

It should be noted that the boron content reported for these soils in Table 7 is reported as parts per million referenced to the dry weight of the soil. If it is assumed that all of the boron found by these analyses exists in the soil as compounds that are soluble in the soil solution, then it is clear that the boron concentration of the soil solution would be much higher than that reported for the soil.

In Table 7 is reported, in addition to the boron content, the total salt content of the soil as measured by electrical conductance, and the water-holding capacity as measured by the water required to saturate the soil. The salt content or conductance (Ks == specific conductance of the saturated soil) is expressed as reciprocal ohms X 10^{-5}. The moisture content at saturation, expressed as percentage of the dry weight of the soil, is determined by the quantity of water necessary to add to the dry soil to bring it to a semi-fluid condition when thoroughly mixed with a spatula, and to exclude the air. It is in this condition of saturation that the conductance is determined. The "moisture content at saturation" is approximately twice the moisture content of the soil at "field-carrying capacity" or at the "moisture equivalent." Thus in the case of soil No. 23 where the moisture at saturation was found to be 30 per cent, it may be assumed that the field-carrying capacity is 15 per cent, and that if all the boron found in this soil were soluble in the soil solution the concentration of boron in that solution would be 6-2/3 times 8.30 or 55 parts per million.

Table 7.- Soils from the Bakersfield (Calif.) area. Boron content expressed as parts per million, conductance of the saturated soil, and water content of the soil at saturation.

Lab. No.	Location	Boron	Ks X 10^{-5} at 25° C.	Moisture content at saturation, per cent
23	Section 17-31-30	8.30	48	30
24	" 20-30-30	5.35	66	25
25	" 3-31-30	30.30	67	53

The total salt content of these soil samples is relatively low. It is not uncommon to find irrigated soils in which the conductance (Ks) ranges from 150 to 200 in this scale and yet are highly productive. It is not impossible that some other factor or factors may be operating in this Bakersfield area to injure the crops, but the evidence of these surveys supports the view that the high-boron content of some of these waters may be the chief cause of the trouble.

May 25, 1929. Carl S. Scofield.

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W E E K L Y R E P O R T S
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Vol. XXXI June 1, 8, 15, 1929 No. 12

Belle Fourche

For the week ending June 1 the maximum temperature was 77, minimum 37, and precipitation 3.84 inches. As it rained every day during the week, no field work was possible.

The sheep were sheared on May 24 and dipped on May 31. The sheep and lambs were weighed and put on sweet clover, alfalfa, and native pastures. The fall pigs were weighed and put on rotations 65 and 69.

The plums and apples in both the dry land and irrigated orchards were sprayed with lime sulphur and lead arsenate in the proportions of 4 pounds of lime sulphur and 1½ pounds of lead arsenate to 50 gallons of water.

Data for the years 1924 to 1929, inclusive, on the wool from the sheep kept on the field station are given in the following tables.

Data on the Wool from the Purebred Hampshire Sheep

	Ewes, age unknown		5-year old ewes		4-year old ewes		3-year old ewes		2-year old ewes		1-yr.old ewes		6-year old bucks	
ear	No.	Av. weight of wool	No.	Av. wt. of wool	No.	Av. wt. of wool	No.	Av. wt. of wool	No.	Av. wt. of wool	No.	Av. wt. wool	No.	Av. wt. of wool
		lbs.		lbs.		lbs.		lbs.		lbs.		lbs.		lbs.
924	17	6.80	--	--	--	--	--	--	-	--	-	--	-	--
925	11	7.85	9	9.60	--	--	--	--	-	--	-	--	1	15.2
926	7	7.07	9	8.22	8	10.75	--	--	-	--	-	--	1	12.5
27	3	6.83	9	8.50	7	10.50	15	9.48	-	--	-	--	1	11.5
928	3	6.40	7	8.81	6	10.78	13	11.42	9	11.42	-	--	1	11.6
29	3	6.50	5	8.47	6	10.05	11	10.37	8	10.20	18	9.98	1	11.0
. of group		6.91		8.72		10.52		10.42		10.81		9.98		12.36

Comparison of the Wool from the Hampshire and Grade Hampshire Ewes

Year	All ages Hampshire		All ages Grade I X H		All ages Grade 2 X H	
	No.	Average wt. of wool	No.	Average wt. of wool	No.	Average wt. of wool
		lbs.		lbs.		lbs.
1924	17	6.80	--	---	--	---
1925	20	8.64	16	10.64	--	---
1926	23	8.73	37	10.93	--	---
1927	34	9.20	48	10.48	9	10.92
1928	38	10.44	44	10.61	25	11.68
1929	52	9.73	35	10.55	45	11.08
Group av.		8.92		10.64		11.23

Note: The grade Hampshire I X H ewes are a cross between a purebred Hamsphire buck and range ewes. The Grade Hampshire 2 X H ewes are a cross between a purebred Hampshire buck and grade Hampshire IX H ewes. The age of the grade ewes correspond with the ages of the Hampshire ewes with the exception of three old Hampshire ewes whose ages are not known.

Belle Fourche (cont'd)

The average clip from the original purebred Hampshire ewes acquired in 1924 is 6.91 pounds per ewe. The average clip from the one to five-year old ewes raised on the field station is 10.09 pounds, an increase of over 3 pounds per ewe. Comparing purebred, all ages, against first and second crosses of range ewes, there is an increase of 1.72 and 2.31 pounds, respectively. The average clip for the range ewes was 9.53 pounds.

For the week ending June 15 the maximum temperature was 88, minimum 45, and precipitation .05 inch.

There was a total precipitation of over 5 inches during the last week in May and the first week in June. No field work was possible until the 10th of June. During the week the beets and corn were all cultivated, and potatoes were planted in Field A, Maximum Production, and varieties in G. Thinning of beets was started the first of the week and is about half completed. Millet and sorghum were planted in Field G June 10.

The Boys' and Girls' Club Camp will be held at the field station during the week of June 17.

Beyer Aune.

Huntley

During the week ending June 1 the maximum temperature was 82, minimum 30, and precipitation .43 inch. The total precipitation for the month of May amounted to but .50 inch as compared to the normal of 2.29 inches. The month of April was also deficient in rainfall, and available soil moisture is relatively low.

Field work during the week consisted of ditching of all fields, the irrigating "up" of corn, beans, and potatoes, and chopping out weeds.

Dr. F. W. Miller of the Bureau of Dairy Industry was a station visitor on May 31.

Weather conditions were very favorable for crop growth during the week ending June 8 and crops on the station are beginning to make rapid progress. The maximum temperature recorded was 82, minimum 36, and precipitation .52 inch. Despite the slightly more than one-half inch precipitation received, conditions of drouth are still prevalent and irrigating of crops on the station constitutes the major enterprise at this time.

In addition to irrigating, station labor during the week has been utilized in cultivating crops and chopping out weeds. Beet thinning was begun in the irrigated rotations on Friday, June 7.

Sheep in the flock maintained by the station were sheared during the previous week. Very satisfactory clips were obtained. The wool is to be sold through the Huntley Project cooperative wool pool.

Continued warm weather prevailed during the week ending June 15, the maximum temperature reaching 88°. The minimum temperature was 38°, and the precipitation .30 inch.

Irrigating of crops continued to occupy considerable time during the week. Some ditching was performed, and other labor was employed in

Huntley (cont'd)

chopping out weeds on both the irrigated and dry land. The corn plots were cultivated.

Mixed-grass from pasture plots A-IV-7 and 8 was cut and placed in the silo to be used as feed for dairy cattle. The yield from this first cutting of grass amounted to 9,600 pounds per acre.

On the project a small part of the beet acreage is being abandoned, due to stand failure as a result of drouth and damage from blackroot disease.

The necessity for irrigating beans to provide moisture for germination makes the early prospects for this crop not very promising. Grains on dry lands adjacent to the project are showing some injury from lack of moisture.

Dan Hansen.

Prosser

The series of alkali plots near Mabton, Washington, which have been under experimental treatment and observation for three years, were given their fourth treatment during the week ending June 15. These plots have been receiving gypsum, sulphur, aluminum sulphate, and agricultural lime in different amounts, and they have been heavily irrigated. The sulphur plots show a significant change in the general tillableness of the soil this year. No marked effect is noticeable on the other plots. The soil on these is so hard when dry that a heavy disc-harrow with three men riding on it will hardly make an impression; but on the sulphur plots the disc sunk in readily and the soil worked up into fairly good tilth. It is planned to sow a mixture of sweet clover and strawberry clover (Trifolium fragiferum) on these plots next week.

Ground-water samples and elevations were taken on two drainage locations near Grandview. The elevations show a considerable rise since the May readings were taken. The conductance($K \times 10^{-5}$ at 77° F.) of the samples ranged from 60 to 150, and the water in the two open drains shows a conductance of 61 and 58, which when converted into parts per million is approximately 360 p.p.m. and 350 p.p.m., respectively.

A second set of water samples from different drains in the valley and from certain laboratory samples which have accumulated during the last year were sent to Mr. Breazeale at Tucson for regular analyses. Part of these analytical results are to be used as a check on similar determinations made at this station and also as a basis for computing the total salt balance between the inflow by irrigation water and the outflow by drainage water from the Wapato Project.

Planting of crops on the station has just been completed this week. Field E-5b, which is used for irrigation experiments, was planted to potatoes on June 11. This field contains 10 duplicate plots which are to receive different amounts of irrigation water during the season. A uniform irrigation of 8 acre-inches was applied to the field two days before planting.

A considerable saving of water on the station is resulting this year from the use of close corrugations (18 inches apart) on the fields of new alfalfa and sweet clover seeding. The average amount applied at each irrigation this year is about 5 acre-inches, while in previous years where the corrugations have been from 24 to 36 inches apart the average irrigation has been about 8 acre-inches.

Prosser (cont'd)

A movement has been started by a group of business men from different towns in the lower valley to have an investigation made of the financial condition of each irrigation district and local improvement district in the Yakima Valley east of Granger. The Federal Farm Loan Bank and some private mortgage companies, together with the counties and irrigation districts, have had to foreclose so many tracts of land recently that the situation is beginning to be serious. At a meeting in Sunnyside on May 17 it was reported that Benton County has now foreclosed more than 70,000 acres of land in irrigation districts for delinquent taxes, and that the irrigation districts have also foreclosed on more than 57,000 acres, in addition, for delinquent water-right assessments. In addition to this, the Federal Farm Loan Bank of Spokane has taken over more than 120 farms in the lower valley.

The maximum temperature for the week was 83, minimum 43.5, and precipitation .62 inch in four showers. This is more rain than the total that had fallen from February 1 up to that time.

Mr. Leslie H. Smith, a senior at the State College, began work at this station on June 1. He is assisting in the irrigation investigations this year.

C. C. Wright.

San Antonio

Report for week ending June 1 and summary for May.

The following meteorological data were recorded.

Week ending	Temperature (° F.) Maximum Absolute	Maximum Mean	Minimum Absolute	Minimum Mean	Mean	G. D. R.	Precipitation	Sky (days) Clear	Partly cloudy	Cloudy
							inches			
June 1	87	83.6	63	68.3	75.9	24	1.40	0	1	6
Month of May	101	85.9	40	64.3	75.1	50	8.23	6	12	13

Cool, cloudy weather with frequent showers continued throughout the week. Precipitation was recorded every day. Field work was impossible for the most part, and fields on the field station and in this section are becoming very foul with weeds and grasses.

The month of May was characterized by frequent rains, cloudy weather, and few extremes in temperature. The precipitation for the month totaled 8.23 inches, almost 2 inches greater than has ever been recorded at the station for the month of May and almost three times the normal rainfall of 2.98 inches. This is also the third highest rainfall ever recorded for a period of one month at the station. Evaporation from a free-water surface was 5.98 inches as compared with 6.65 inches average for the period 1911 to 1928, inclusive. Wind movement averaged 3.6 miles per hour for the month, which is .1 mile per hour below the average.

Conditions during May were favorable for crop production for the most part. Small grains were damaged considerably in the shock by the frequent rains and cloudy weather. The quality of the grain will be reduced by molding and sprouting. Corn and milo made excellent growth

San Antonio (cont'd)

and a good crop is assured from the moisture standpoint. Feed crops, which at the first of the month were beginning to suffer from lack of moisture, are now approaching maturity and a medium tonnage will be harvested. Cotton emerged to good stands in May and, although very weedy, is making fair to good progress.

Work at the station has consisted principally of repair work and miscellaneous small jobs during the past week. Although fields were still very wet, some cotton thinning was done the last two days.

During the week ending June 8 the following meteorological data were recorded: Maximum temperature 91, mean maximum 89; minimum 68, mean minimum 70.4; mean 79.7; greatest daily range 25°. No precipitation was recorded. Four days were clear, three partly cloudy, and none cloudy during the week.

Very favorable weather occurred throughout the past week. Clear, warm weather, following the cool, rainy weather of the last two weeks of May, has caused rapid growth of all crops in this section. Weeds were abundant at the close of the rainy weather, but the past week has enabled us to bring them under control to a large extent; and if conditions continue favorable, the fields will soon be reasonably clean.

Cotton has made rapid growth the past week and thinning is in progress throughout this section. Boll weevils have been found on early cotton on the Station, and one farmer reports that they are plentiful in fields north of San Antonio. With weevils numerous this early in the season, serious damage may be expected unless weather unfavorable for their development and increase occurs.

Field work has been possible all of the past week. Cotton in the rotation experiments, on field C-5, A-3, and part of C-6 was thinned and weeded in the rows. All cotton on the station was cultivated once, and plots in the rotations and Field C-5 were cultivated the second time. Johnson grass was chopped from the cotton cooperative series on Field F-3, the variety test of cotton on Field C-4, the Kekchi selections and increase progenies on the Herbst field, and fallow and cropped plots on Field C-5. Chopping out all weeds from the cotton plots in the rotations was started. On June 3 the first cotton plant dead of rootrot was found on A6-3, a continuously cropped plot of cotton.

Corn in the rotation experiments and the variety test was cultivated with a five-shovel one horse cultivator during the week to check weeds which were starting. The main crop of milo in the rotations is fully set, with little midge damage; but later varieties in the variety test will no doubt be damaged to some extent as midge are more plentiful at this time. Birds are damaging the milo, and shooting will be resorted to in order to reduce the injury.

Mr. C. R. Letteer, formerly superintendent of this station, now cotton breeder with the Chapman Ranch near Corpus Christi, Texas, visited the station on June 6.

San Antonio (cont'd)

The following meteorological data were recorded during the week ending June 15: Maximum temperature 95, mean maximum 93.3; minimum 66, mean minimum 69.9; mean 81.8; greatest daily range 27. No precipitation was recorded. Six days were clear, one was partly cloudy, and none was cloudy. Clear, moderate weather prevailed during the week.

Cotton made rapid growth and is squaring freely; a few flowers may be found on early plants. Stand counts of cotton were made on part of the rotation plots. Rootrot has killed plants on a number of the rotation plots. Milo is nearing maturity; and although a boy with a gun has been kept in the field for the past week, sparrows are doing serious damage to some plots. No adequate method of preventing sparrow damage to experimental plots at this station has been found.

Field work during the past week consisted of cultivation of cotton on Fields C-4, C-6, C-7, F-3, and the Herbst tract; cultivation of milo and row sorghums with a one horse cultivator; disking and weeding orchards; and disking fallow plots in the rotations and on field C-5.

Threshing of small grains was started. Oats plots in the rotations, Field C-5, and part of the variety test on Field D-3 were completed. Oats are of very poor quality, being musty and weighing less than 20 pounds per bushel in most cases. This is due to rust and to the rainy weather of May, which caused damage while in the shock.

A number of hoe laborers have been busy all week weeding cotton. Other hand labor was utilized in care of grounds, nurseries, and the garden.

Mr. D. R. Hooton, Assistant Pomologist, U. S. Cotton Breeding Field Station, Greenville, Texas, was at the station June 10 to 13, inclusive, directing the thinning and weeding of cotton in the variety test on Field C-4, the cultural test on Field C-7, cooperative series on F-3, and the Kekchi selections and increase progenies on the Herbst tract.

Mr. H. V. Jordan, Associate Soil Technologist, Bureau of Chemistry and Soils, Austin, Texas, was at the station June 12 taking notes and inspecting the cotton in the cooperative experiments on rootrot control.

I. M. Atkins.

Scotts Bluff

Under date of June 12, Mr. James A. Holden reported as follows:

"The weather in the North Platte Valley has been rather cool. The moisture conditions have been very favorable for germination. The crops came up soon after being planted and are ahead of normal for the most part. So far wind and hail have done very little damage.

"The sugar beet acreage is greater than last year. A very large part of the beets are already thinned. The stand is very good and the prospects are very promising for a good crop. The contract price is $7.00 minimum per ton, which is the same as last year's.

"Although the potato crop last year was a financial failure, there will be as large an acreage in potatoes this year as there was in 1928.

"The alfalfa crop is well advanced and harvesting will begin next week. Very little winterkilling occurred last winter. A rather large acreage was planted this spring even though the seed was very high in price. The stand from the new seeding is very good.

Scotts Bluff (cont'd)

"The spring grain here in the valley under irrigation is very good, but the winter wheat in the dry-land sections of Kimball and Cheyenne Counties is the poorest it has been for a long time. In driving through these counties it looks as though half of the winter wheat fields have been reseeded to either barley, oats, or spring wheat. In some cases this spring-seeded grain is just coming up. Their wheat crop is going to be very short.

"The lamb feeders who marketed their lambs before May made very high profits, while those who held for the May market lost money. In April fat lambs sold well over the $17 mark, reaching as high as $17.85 on the Omaha market. The latter part of May it took choice lambs to bring $13 per hundredweight. Most of the feeders have already contracted their lambs for next fall, paying as high as $13.50, range delivery. Most of these lambs were bought before the May slump in fat lamb prices.

"Cattle feeders lost money during most of the winter but as spring opened up, prices advanced until now cattle are showing a profit.

"The financial conditions in the valley are rather slow. Money is tighter than it has been for a number of years. The potato situation of last year hurt most farmers on the north side of the river, especially under the Government Canal.

"Crops on the Experiment Farm are looking very good, and the livestock are doing well."

Yuma

The maximum temperature for the week ending June 1 was 96, minimum 39, and greatest daily range 47. No precipitation was recorded. A severe sand storm occurred on May 26. Since that date the temperatures have been much lower than normal for this time of the year. For the month of May the mean maximum temperature was 96.2, mean minimum 54.2, mean 75.2. No precipitation occurred during May.

Although handicapped by uneven stands, the cotton fields on the project have a very much improved appearance at this time. Thinning operations are about completed.

Watermelons and cantaloupes are being shipped from a few of the early fields.

The Weather Bureau office at Yuma reports the mean stage of the Colorado River for May to be 23.1 feet; total monthly discharge 2,698,000 acre-feet; 27-year average 2,687,000 acre-feet. The gauge reading for May 31 was 26 feet, with a flow of approximately 73,000 second-feet. Higher water is still predicted.

The threshing of winter grains on the rotations was continued during the week. Cotton plots were hoed and bordered for watering. Stubble plots that were to be fertilized were manured and plowed. All first year alfalfa plots were treated with 300 pounds of superphosphate per acre.

E. G. Noble.

The maximum temperature for the week ending June 15 was 109, minimum 54, and greatest daily range 52. No precipitation was recorded.

The Yuma Valley cantaloupe crop is being marketed rapidly. It is predicted that 500 cars will be shipped this season, which will bring

Yuma (cont'd)

about $200,000 to the growers. The cantaloupes this year are slightly larger than last year because of more favorable weather conditions.

Cotton on the station is growing rapidly since its first irrigation. The earlier plantings are beginning to flower.

The crest of the annual June high-water period on the Colorado River will be reached June 21, after which time the river will fall. The river is now lower than it was expected to be at this time because dry winds have evaporated the snow in the mountains.

Station work during the past week included the cultivation and hoeing of cotton, fencing, and plowing.

Arthur T. Bartel.

W E E K L Y R E P O R T S
Of The Office Of
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Belle Fourche

For the week ending June 22 the maximum temperature was 89°, minimum 42°, and precipitation .10 inch.

The first cutting of alfalfa was started on the 18th and continued through the week. Thinning of beets is about one half completed. All the beets were cultivated.

The spring pigs were weaned and divided into three lots of 13 each; one lot is fed ground barley, one white corn, and one yellow corn. All the lots are self-fed and are on alfalfa pasture.

The following paragraphs were taken from a report of the 4-H Boys' and Girls' Club Encampment, which was held at the Field Station from June 17 to 21, inclusive:

"At the close of the Encampment, records showed 136 boys and girls regularly enrolled in 4-H club activities, 11 boys and girls nonmembers of 4-H clubs, and 5 local leaders. Of those in club work 91 were girls and 45 were boys. The Camp was represented by boys and girls, together with their local leaders, from Ziebach, Meade, Butte, Lawrence, Pennington, and Stanley counties.

"Mr. Aune, Superintendent of the Field Station, helped to make arrangements for the Camp and also assisted during the week. W. R. Hauser, Assistant State Club Leader, was Camp Director; A. D. Ellison, County Agent of Butte County, was General Manager of the Camp; H. A. Mateer, District Club Agent, was in charge of the boys; Miss Della L. Hinkley, Home Agent of Butte County, was in charge of the girls; and Mrs. J. C. Milne, of Belle Fourche, was matron of the girls' camp. C. J. Jack, County Agent of Ziebach County; Harold Doner, County Agent of East Meade County, located at Faith; Miss Johnston, Miss Webster, and Miss Rockhill were instructors. Mrs. M. E. Roberts, of Newell, was chief cook and was assisted by Miss Hestor Calhoun.

"The forenoons were devoted to classroom and field instruction and the afternoons to demonstrations and games, both with boys and girls. Assemblies were held at 1:30 p.m. and again at 7:30 p.m. A stunt program was held on Thursday evening, the last night of the Camp, in which all county groups and various clubs participated.

"All those present voted the Eleventh Annual Boys' and Girls' Club Encampment the best and most successful ever held at the Field Station, and all signified their intention of returning next year."

For the week ending June 29 the maximum temperature was 85°, minimum 40°, and precipitation .95 inch. Except for the first week in June, the rainfall was very light during that month. All small grain and alfalfa must be irrigated.

During the week all the grain and alfalfa in field A was irrigated, and the thinning of beets continued. The harvesting of the first cutting of alfalfa was completed. This cutting was better than the average.

Mr. John Robertson, Master Farmer, Hot Springs, South Dakota, visited the station on the 27th and 28th. Mr. Robertson is operating a commercial apple orchard of which he has made an unusual success.

Beyer Aune.

Huntley

Conditions of drouth which have prevailed during the spring season were somewhat alleviated during the week ending June 22 when precipitation amounting to one inch was recorded. This precipitation was of much benefit to growing crops, particularly to those on the dry-lands. The maximum temperature recorded during the week was 90° and the minimum 34°.

The first cutting of alfalfa hay was made during the week. Potato and corn plots were cultivated for the second time and other labor was utilized in chopping weeds.

Thinning of sugar beets was completed during the week. This crop is making slow growth due to unseasonably cool weather. In the short rotations and the continuously-cropped plots, beets are affected by "black root" disease and stands on these plots are rather poor.

On the lower part of the project, light frost occurred on June 21 and some slight damage resulted to beans. The acreage seeded to this crop on the Huntley Project and in other parts of the valley will probably exceed that of 1928 when the total for Yellowstone County was 30,000 acres.

Arrangements are being made for the Annual Huntley Project Picnic, which will be held on July 4.

Climatic conditions were excellent for crop growth during the week ending June 29, and all crops, particularly corn and beans, made rapid growth. The maximum temperature recorded was 97°, minimum 40°, and precipitation .55 inch.

The first cutting of alfalfa hay in the irrigated rotation experiments and in the plot variation test in fields B-II and B-III was hauled in, weighed, and placed in the barns during the week.

Dan Hansen.

Newlands

The following meteorological data were recorded at this station during the six-week period ending June 15: Mean maximum 75°, maximum 91° on June 13; mean minimum 40°, minimum 28° on June 1 and 2; mean 68°. There was .03 of an inch of rainfall on June 7, .20 inch on June 8, and .03 inch on June 10, making a total of .26 inch for the period.

The temperature of 28° on June 1 and 2 did quite a little damage in the low-lying lands of the project to cantaloupes, grapes, potatoes, and truck crops. A great deal of alfalfa was frosted to such an extent that the blossoms were killed. As a result much hay is being cut with very little bloom in evidence. The continued cool weather has not promoted a heavy growth of alfalfa, and the first crop will not be so good as usual. However, the cool weather has been ideal for grain.

A great deal of the alfalfa on the station started new basal shoots, showing that little further growth could be expected of the older stems. This condition was the reason for cutting the first crop. This cutting is now curing in the shock.

The seedings made at the station during this period were as follows: Variety corn planted on C-12; ensilage corn planted on C-11, D-7, E-1, E-2, E-7, E-8, and F-5; alfalfa planted on D-4, D-8, F-8, Y-6 to

Newlands (cont'd)

Y-10, inclusive; and safflower was planted on C-13.

The continued cool weather makes it highly improbable that the variety corn will mature. The ensilage corn should progress to a stage fitting it for silage.

Other work at the station has consisted of cultivating beets and corn, spraying the orchard for codling moth, and two general irrigations.

The boron work is awaiting the arrival of some apparatus and chemicals. The direction of this further investigation is set forth in the following outline.

Boron investigation of the soil horizons encountered in drilling 25 wells on the Newlands Field Station.

Object: To determine the amount of salts, particularly of boron, in the soil solution of the various soil horizons, and, if possible, the amount of boron salts that plant roots can tolerate.

Procedure: 1. Select several wells, probably from cropped areas such as Nos. 8, 16, and 19, that have shown a high boron content in the underground water. 2. Determine the conductance of the saturated soil. 3. Determine the amount of boron salts present in the soil of each horizon. Reference this amount to the dry soil and determine the approximate concentration in the soil solution. 4. Make a water extract of the soil from the critical zones and determine the boron content of the soil by distillation. Make this water extract by digesting about 2 kilos of soil with a volume of water equal to five times the saturation percentage, filter off the water and make a boron determination of this water to get a figure for the water-soluble boron to compare with the total boron. 5. In horizons where the amount of boron salts are found to be so high that injury would be expected, an endeavor should be made to trace the plant roots. The object of this would be to determine if the roots are really in contact with subsoil carrying boron salts in quantities that have been known to cause plant injury. This would be of particular interest from wells located in alfalfa areas such as Nos. 16 and 19. 6. Bore holes 50 to 75 feet north, south, east, and west of the selected wells, repeating the above procedure as well as determining the character and amount of salts in the underground water.

Some work has been done in the laboratory to find out how accurately increasing amounts of gypsum added to irrigation water can be determined by the use of the electrolytic bridge. The following table gives the results of this experiment.

Newlands (cont'd)

Determining amount of gypsum in irrigation water by electrolytic bridge. About 1 liter of water put in each of several gallon bottles and gypsum added to make a series up to about 10r added Ca.

Ditch water

No.	Ki ($x10^{-5}$)	Kf ($x10^{-5}$)	r Ca total	r Ca added by $KMnO_4$	r Ca by G formula	C == 10
Check	31.3	---	1.22	---	---	
1	31.3	43.0	2.32	1.10	1.18	
2	31.3	52.7	3.33	2.11	2.19	
3	31.3	65.9	4.80	3.58	3.58	
4	31.3	71.7	5.47	4.25	4.20	
5	31.3	80.1	6.17	4.95	5.07	
6	31.3	88.5	7.35	6.13	6.08	
7	31.3	90.8	7.43	6.21	6.32	
8	31.3	117.0	10.95	9.73	9.38	

Average deviation 2.5%

Tap water

						C == 9
Check	62.7	---	1.01	----	----	
1	----	69.5	2.06	.75	.76	
2	----	76.8	2.90	1.59	1.59	
3	----	83.0	3.60	2.29	2.31	
4	----	90.2	4.44	3.13	3.14	
5	----	96.3	5.17	3.96	3.89	
6	----	101.5	5.72	4.41	4.50	
7	----	107.4	6.60	5.29	5.22	
8	----	114.1	7.50	6.19	6.07	
9	----	142.0	10.65	9.34	9.70	
10	----	165.5	14.25	12.94	12.90	

Average deviation 1.48%

Formula

$$r\ Ca = \frac{Kf - Ki}{C - .0\ (Kf - Ki)}$$

Kf == Final K of water
Ki == Initial K of water } $x10^5$

C == A constant varying from 10 when Ki is 32 to 9 when Ki is 62.

One further run of the gypsum machines was conducted during this period, the results of which were as follows:

	Y Machine	H Machine
Date of run	May 14	May 14
Length of run (hours)	3.5	1.5
Head of water (feet)	.45	.20
Flow of water (second-feet)	6.7	7.30
Gypsum put in (pounds)	1,840	644
Gypsum in solution (pounds)	1,200	456
Gypsum in solution (per cent)	65	71
r Ca composite	2.65	3.15
K of composite ($x10^{-5}$ at 25° C.)	59.3	56.6
r Ca above machine	1.25	1.25
K of water above machine ($x10^{-5}$ at 25° C.)	33.6	33.6
Area treated (acres)	6.3	2.1

Newlands (cont'd)

The Nevada State Experiment Station is erecting a 30-ton plastered silo of the Gurler type so that additional silage may be fed in some winter tests with dairy cows, and is also constructing a 16 by 18 feet rat-proof granary in which a 7½ horse power motor and a feed grinder are being installed. The present plan is to purchase, if possible, from local farmers all the grain that is fed to cows and hogs and grind it in this machine. We also hope to use the motor as power to run the ensilage cutter.

E. W. Knight.

San Antonio

During the week ending June 22 meteorological data were recorded as follows: Absolute maximum temperature 96°, mean maximum 93.6°; absolute minimum 67°, mean minimum 69.9°; mean 81.7°; greatest daily range 28°; .06 inch of precipitation was recorded. There were three clear, four partly cloudy, and no cloudy days.

The weather of the past week has been favorable for cutting and curing the first crop of sorghum and Johnson grass hay. Very little moisture is available to start a second crop of forage. All crops on the station would be greatly benefited by a good rain. Corn is ripening somewhat prematurely because of lack of sufficient moisture, although milo and cotton apparently have not suffered materially as yet.

Threshing of all small grains has been completed. Yields of small grains were lower than expected, and the quality of oats and barley was very poor. Excessive rains during May caused sprouting and moulding in the shock until the grain was very light and so mouldy as to be unfit for feed in many cases. Yields were also reduced by birds. Flax produced fair yields, but the quality of grain was damaged by sprouting in the shock. Yields were decreased materially by reduction in stand caused by the February freeze. Tables giving yields of all small grains and flax follow.

Small Grain Variety Test, 1929

Variety	C.I. No.	Ser. I	Ser. II	Ser. III	Average	Test weight
		Bushels	Bushels	Bushels	Bushels	Lbs. per bu.
Wheat						
Kubanka	----	----	----	----	13.6*	56.3
Ceres	6900	13.7	14.0	15.8	14.5	56.3
Marquillo	6887	13.2	12.9	14.0	13.4	52.7
Hope	8178	12.2	12.0	12.5	12.2	44.0
Reliance	7370	14.0	17.2	16.1	15.8	56.0
Mindum	5296	15.0	17.2	18.0	16.7	59.7
Oats						
S.A. Selection 1913	----	----	----	----	23.6*	18.3
Texas Red Rustproof	----	18.1	23.3	22.9	21.4	17.8
Ferguson No. 922	----	25.6	26.6	24.4	25.2	17.8
Nortex	----	26.3	28.0	23.5	25.9	17.7

San Antonio (cont'd)

Small Grain Variety Test, 1929 (cont'd)

Variety	C.I. No.	Ser. I	Ser. II	Ser. III	Average	Test weight
		Bushels	Bushels	Bushels	Bushels	Lbs. per bu.
Barley						
Hannchen	531	16.2	17.5	19.8	17.8	45.5
Wisconsin Winter	2159	14.4	15.8	16.1	15.4	33.5
Tennessee Winter	3543	14.2	15.8	13.3	14.4	32.2
Tennessee Winter	3546	14.6	15.4	14.2	14.7	31.3
Stavropol	--	18.2	16.9	19.8	18.3	34.0
Vaughn	1367	23.9	21.9	22.3	22.7	34.0
Trebi	--	9.8	6.3	8.8	8.3	36.8
Texas Winter#	--	--	--	--	15.6#	36.2

* Average of all check plots.

\# Texas Winter stand was very poor due to poor seed. Yields not comparable.

Yield of Oats (Grain), Rotation Experiments

Plot	Rank	Yield	Test weight	Rotation and cultural treatment
		Bu.	Lbs.per bu.	
A4- 5	1	25.1	20.0	Oats, plowed June; fallow.
B5- 8	2	23.5	19.5	Oats continuously; plowed October.
A4-15	3	22.0	20.0	Oats, plowed June; milo, field peas for hay, plowed spring; sorghum, plowed Nov.; cotton, plowed fall.
A4-11	4	21.5	20.5	Oats, plowed June; milo, field peas for manure, plowed spring; sorghum, plowed Nov.; cotton, plowed fall.
A5- 7	5	16.9	20.5	Oats, plowed June; cotton, plowed Nov.; milo, plowed July; cotton, plowed fall.
A5-11	6	9.1	19.5	Oats, cowpeas for green manure, plowed fall; cotton, plowed Nov.; milo, manure, plowed July; cotton, plowed fall.
A6-16	7	8.5	17.5	Oats, manure, subsoiled June; corn, plowed July.
A5-16	8	7.9	20.5	Oats, cowpeas for green manure, subsoiled fall; cotton, plowed Nov.; milo, manure, subsoiled July; cotton, plowed fall.
Avg.		16.8		
		Yields of oats--rootrot-fallow experiment, Field C-5		
C5- 9	1	10.0	14	Small grain following cotton 1928
C5- 8	2	9.8	14	Small grain following fallow 1928
C5- 6	3	9.6	13	Small grain following fallow 1928

San Antonio (cont'd)

Flax Variety Test, 1929

Variety	C.I. No.	Ser. I	Ser. II	Ser. III	Average	Test weight
		Bushels	Bushels	Bushels	Bushels	Lbs. per bu.
N. Dakota Resistant	13	---	---	---	11.9*	48.7
Redwing	320	6.5	7.4	9.5	7.8	49.7
North Dakota No. 720	318	10.1	11.9	11.6	11.2	48.5
Linota	244	9.2	11.3	12.5	11.0	45.2
Selection 4-1	260	7.9	10.4	12.5	10.3	47.3
Bison	---	5.3	8.0	9.8	7.7	46.7
Long No. 79	280	8.8	14.1	13.8	12.2	46.7
Morteros	107	12.6	15.2	15.7	14.5	46.3
Rosquin	109	14.5	17.1	16.0	15.9	45.2
Winona	---	4.4	6.6	7.6	6.2	48.3

* Average of ten check plots.

Test weight of flax is low due to sprouting in the shock during the wet period of May.

Work other than threshing has consisted of harvesting alfalfa and Johnson grass for hay on E-3, C-4, A-7, and along the sewer ditch on C-6; weeding of cotton on field F-3, the Herbst tract, C-4, C-6, and C-7; plowing of part of the rotation plots scheduled for June plowing; miscellaneous weeding of orchards and nurseries; and care of grounds. Stand counts of all rotation plots of cotton were completed, and plants dead of rootrot were found on 14 of the 30 plots. On June 20 three plants dead of rootrot were found in two points of infection on plot C5-1 which has been held in clean fallow in the rootrot-fallow experiment since March 1927. Since that date six more initial points of infection have been found on this plot. Boll weevil are doing considerable damage to cotton. In a count made on field C-5 30 per cent of the bolls were punctured.

Dr. D. C. Neal, Senior Pathologist, Office of Cotton, Rubber, and Other Tropical Plants, Greenville, Texas, was at the station June 15 to 18 in connection with his cooperative experiments at this station.

I. M. Atkins.

Meteorological data recorded for the week ending June 29, together with a summary for June 1929 compared with averages for the same month during the period of observation at this station, are given in the following table.

Period	Temperature: Maximum: Absolute	Temperature: Maximum: Mean	Temperature: Minimum: Absolute	Temperature: Minimum: Mean	Temperature: Mean	Precipitation	Aspect of the sky: Clear	Aspect of the sky: Partly cloudy	Aspect of the sky: Cloudy
						Inches	Days	Days	Days
Week ending June 29, 1929	96	93.3	65	69.5	81.6	2.28	4	2	1
June 1929	96	92.0	65	70.2	81.1	2.34	18	11	1
Avg. June 1917-1929	108	100.4	47	61.5	81.9	2.78	--	--	--

San Antonio (cont'd)

A remarkable feature of the June weather was the almost perfect uniformity of temperatures when compared one day with another. This was especially true the last three weeks of the month, the thermograph curve for each day being almost an exact duplicate of that for the preceding day. There was no rain worthy of the name during the month until the 28th when a total of 2.19 inches was received. There were several small showers during the day of the 28th, accompanied by little or no wind disturbances, but during the night a heavy rain occurred in conjunction with a strong and rather freakish wind-storm. Throughout the region an occasional tree was uprooted, many branches were broken, fruit was stripped from trees, and corn and sorghums were badly lodged. Cotton is believed to have been undamaged. In the city of San Antonio considerable damage resulted from falling trees, branches and street signs, plate glass windows blown in, and automobiles blown broadside across slippery streets. Wind velocities were much higher toward the Gulf Coast and damage to crops and buildings correspondingly greater.

The complete lack of rainfall for the first 27 days of June was more disastrous to corn than to other crops. Closely spaced or weedy fields rapidly used the available moisture and fired badly. Hay sorghums produced good first cuttings but were in need of additional moisture to renew growth. Grain sorghums and cotton enjoyed the prolonged dry, warm weather and progressed satisfactorily. Cotton is flowering freely and with a normal break of favorable weather should produce better than average yields this season.

Station activities during the week included harvesting broadcast sorghum in rotations, dwarf broomcorn in the variety test, and Johnson grass in waste areas; cultivating all cotton plantings; weeding orchards and nurseries; shooting birds in grain sorghum plantings; and watering grounds, nurseries, and young orchard trees.

Geo. T. Ratliffe.

Umatilla

Cool, cloudy weather characterized the two-week period ending June 15. The maximum temperature was 88°, the minimum 33°, and the precipitation totalled .79 inch. The season as a whole continues to be backward.

The first crop of alfalfa was put up under difficult conditions on account of the rain. The general farm work has consisted of hoeing and irrigating.

O. A. Hills, Junior Pathologist of the Bureau of Entomology, reported on June 4 to work on the curly-top project. H. E. Wallace, of the Twin Falls (Idaho) laboratory of that Bureau, spent several days here arranging Mr. Hills' work. They found considerable numbers of leaf hoppers, Eutettix tenellus, at work on the vegetables, especially on the sugar beet plots, which were planted to attract them so that they can be collected on the station for artificial inoculation. On June 15 a tomato plant which was the first to show the disease from natural infection was found. Squash and beans, which usually show the disease first, are still in good condition.

H. K. Dean.

Yuma

The maximum temperature for the week ending June 22 was 113°, minimum 54°, and greatest daily range 56.5°. No precipitation was recorded.

With temperatures in excess of 100° for the past several days, cotton has made a very rapid growth. All the cotton plots on the station are now well along in the fruiting stage.

Present reports from gauge stations up the Colorado River indicate that the crest of the 1929 flood has been reached. Although some minor breaks have been reported on the levee system in Mexico, the flood protection works of the Yuma Project were maintained in good shape.

Farming activities on the project consisted mostly of harvesting cantaloupes, watermelons, and alfalfa hay, and preparing land for grain sorghum and Indian corn.

Work on the station included the mowing of the third crop of alfalfa hay, cultivating cotton, cleaning and repairing ditches, general irrigating and hoeing.

The maximum temperature for the week ending June 29 was 116°, minimum 61°, and greatest daily range 53°. No precipitation was recorded.

During the last ten days the maximum daily temperatures have been around 110°. These high temperatures have been accompanied by short periods of high winds. For the month of June the mean temperature was 84.5°, or .2° below normal. This is the eighteenth consecutive month with subnormal rainfall.

The low temperatures recorded previous to June 20 have caused the cotton plants to be somewhat smaller than normal but probably more fruitful. The present setting of squares and small bolls indicate a very good prospective bottom crop. The recent high temperatures have caused a closer interval between irrigations. On the station the cotton plots are now being irrigated once a week. The Pima strains, Lonestar, Mebane, and Acala varieties, in the maximum production tests were given a side dressing of 125 pounds per acre of Ammo-phos. This is a concentrated commercial fertilizer testing 20 per cent phosphoric acid and 10 per cent ammonia.

The mean stage of the Colorado River for the month of June was 25.7 feet and the discharge at Yuma for the month was 4,691,000 acre-feet. The 27-year average for June is 4,297,000 acre-feet. The flow of the river at present is slowly diminishing.

Station work performed during the week included the cutting of the fourth crop of alfalfa hay, plowing under sweet clover and cowpeas on the rotations, planting grain sorghums, and cleaning and repairing ditches.

Mr. T. H. Kearney and Mr. George Harrison, of the Office of Egyptian Cotton Breeding, were station visitors June 24 and 25.

E. G. Noble.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

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Belle Fourche

The maximum temperature during the week ending July 6 was 93, minimum 54, and precipitation 1.45 inches.

The first cutting of alfalfa was finished the first of the week. The rain the last of the week came just in time to save the dry land crops. It was a great help to the beets and corn even on the irrigated land. During the week the alfalfa was irrigated in fields O, K, P, and W, and all the grains were irrigated.

All crops are in very good condition at this time, particularly the sugar beets, small grains, and corn.

An economic survey conference was held in Newell at the office of the Bureau of Reclamation on the 9th.

Beyer Aune.

Huntley

The maximum temperature for the week ending July 13 was 93, minimum 49, and precipitation .49 inch.

Good growing weather was experienced throughout this period and crops are making rapid progress. Irrigation of crops on the station has continued to occupy the major portion of the labor force. Considerable hand chopping of weeds has been necessary.

Winter wheat on the dry lands adjacent to the project is beginning to ripen, and the harvest of this crop will soon be under way. Due to lack of moisture, most of the dry-land winter wheat is heading out on relatively short straw and less than normal yields may be expected.

Messrs. Hansen and Seamans left the station via automobile on Monday afternoon for Mandan, North Dakota, where they met Mr. Hastings who returned to Huntley with them on Saturday after inspecting the work of the field stations at Mandan and Dickinson, North Dakota, and at Miles City, Montana, as well as observing agricultural conditions en route.

Dan Hansen.

Newlands

The following meteorological data were recorded at this station during the four-week period ending July 13: Mean maximum 91.3, maximum 99 on June 28; mean minimum 50.8, minimum 33 on June 17. No rainfall was recorded for this period.

The work on the station has consisted of cultivating beets and corn; cutting the first crop of alfalfa, the oats on Y-6, 7 and 8, and the barley on F-6. There was also one general irrigation during the period.

The yields recorded for the first crop of hay were 23 per cent less than the yields of the first crop last year. This figure was obtained by comparing the yields obtained from the same areas of old alfalfa during the two years. The rather cool, backward spring was the cause of

Newlands (cont'd)

the lower yields. The second crop is growing rapidly and all indications point to a heavy yield.

The boron work in the laboratory has been held up to some extent awaiting the necessary funds to purchase equipment. However, this equipment is now arriving, and the work should be in full swing within another week or ten days. The equipment that is on hand is being assembled.

E. W. Knight.

San Antonio

During the week ending July 6 the following meteorological data were recorded: Maximum temperature 93, mean maximum 88.9; minimum 69, mean minimum 71.3; mean 80.1; greatest daily range 21 degrees; precipitation 1.72 inches. There were three clear and four cloudy days during the week.

An unusually large amount of precipitation has occurred at the station for this time of the year. In addition to the rain of 2.19 inches reported last week, rain totalling 1.72 inches fell during the current week. This precipitation came in several showers and no run-off of importance occurred.

Cotton and hay crops are taking full advantage of the abundant moisture. The first crop of sorghum hay on rotation plots has not been stacked because of wet weather. This crop is doing some damage by smothering the new growth which is starting. Cotton is squaring and blooming freely, but boll weevils are destroying a large percentage of the squares and bolls. A regular windrow of fallen squares was observed following the rains of the past week.

Milo and row sorghums for hay were harvested during the past week. All row crops were badly lodged by the wind-storm of June 28. As the crops were harvested soon afterwards no material damage was done to the lodged grain, although some was lost in harvesting. There was a very satisfactory crop of milo on many of the rotation plots. On other plots the birds damaged 50 per cent or more of the crop.

Field work other than that already mentioned consisted of capping all milo shocks to prevent further bird damage, manuring A6-16, turning sorghum hay in windrows, weeding of cotton on field A-3, and miscellaneous weeding of fence rows. The flax classification nursery was threshed during the rainy weather.

Meteorological data were recorded as follows during the week ending July 13: Maximum temperature 92, mean maximum 89.1; minimum 70, mean minimum 71.3; mean 80.2; greatest daily range 19 degrees; precipitation .94 inch. One day was clear, five days were partly cloudy, and one day was cloudy during the week.

Conditions have been especially favorable for the growth of cotton during the past week. Plants are standing 30 to 52 inches tall at present and will no doubt make unusual plants if favorable weather continues. Boll weevil are increasingly numerous and rootrot is spreading rapidly. Hay crops have started vigorous second growth. The first crop of forage sorghum on rotation plots was damaged severely by wet weather, and the crop from several plots was entirely unfit for feed.

San Antonio (cont'd)

Activities of the station consisted of cultivating cotton in the rotation experiments, fields A-3, C-4, F-3, and the Herbst tract; weeding cotton in the rotations and A-3; hauling sorghum hay; plowing rotation plots; disking alleyways in the rotations; weeding nurseries; and care of the grounds.

I. M. Atkins.

Yuma

The maximum temperature for the week ending July 6 was 113, minimum 69, greatest daily range 42. No precipitation was recorded. The period of high daily temperatures and humidity continued during the week. This humid weather is usually encountered later in July.

Cotton on the project continues to look very good. The bolls are quite large on the early planted cotton. Observations made on the alfalfa fields in various parts of the project indicate that a normal crop of alfalfa seed will be ready to harvest in about two weeks. The planting of grain sorghums on the project has been completed.

The present discharge of the Colorado River at Yuma is approximately 53,000 second-feet. The gauge reading shows a gradual decrease from day to day.

Station work performed during the week included planting grain sorghums and corn, cultivating cotton, plowing sweet clover plots, cleaning ditches, and repairing fences.

E. G. Noble.

The maximum temperature for the week ending July 13 was 109, minimum 66, and greatest daily range 43. No precipitation was recorded. Five days of the week were partly cloudy, the remaining two were clear.

The Yuma Valley grape crop is nearing maturity. Two carloads of grapes have already been shipped from the project.

All the alfalfa and cotton plots in the rotations are now being watered once every week. Even with such frequent irrigations, alfalfa in the sandier soils often shows wilting. The alfalfa seed plots in the rotations are nearing maturity and will be cut soon. The next crop in these plots will again be left for seed.

Station work for the past week included the harvesting of sweet clover seed plots in the rotations, planting milo and Sudan grass, hoeing cotton, and propping up date bunches.

Arthur T. Bartel.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI July 20 and 27, 1929 No. 15

Belle Fourche

The maximum temperature for the week ending July 20 was 94, minimum 59, and precipitation 1.26 inches.

Most of the time was spent in cleaning up and getting ready for the farm picnic which was held on July 20. The weather conditions were ideal. More than 2,000 people attended during the day.

For the week ending July 27 the maximum temperature was 101 and the minimum 60. No precipitation was recorded.

Beets and corn were irrigated during the week, and the harvesting of the second cutting of alfalfa was begun.

Mr. S. H. Hastings visited the station on the 23d and 24th, and Mr. A. C. Dillman and Mr. J. Allen Clark on the 26th and 27th.

Beyer Aune.

San Antonio

Report for the week ending July 20.

Unusually cool weather for this season of the year continues to prevail. The mean temperature for July is considerably below normal to date. This has been as much due to a lack of high maximums as any other factor, the maximum for the month to date being 95 degrees. The mean temperature for July for the past 22 years was 84.3, with absolute maximums running over 100 in all except two years. The mean temperature for the first week of July was 80.1; the second week 80.2; and the past week 81.8. The mean maximum temperature for the past week was 92, minimum 70, mean minimum 71.6; greatest daily range 23 degrees; precipitation .06 inch. Five days were clear, one was partly cloudy, and one was cloudy.

Cotton continues to make rapid plant growth, but practically no squares are even reaching the blooming stage due to boll weevil. Root-rot is spreading rapidly.

Activities of the station consisted of preparing the ground and planting cowpeas on two rotation plots; disking plot alleys; mowing roads, fence rows, and waste land; cultivating all orchards; cultivating cotton in fields C-6, C-7, and all rotation plots; weeding cotton on fields C-5, C-6, and C-7; and weeding orchard A-1.

Dr. D. C. Neal, Senior Pathologist, and his assistant, K. C. Gunn, Office of Cotton, Rubber, and Other Tropical Plants, Greenville, Texas, were at the station July 18, 19, and 20 in connection with their cooperative experiments at this station.

The unusually cool July weather continued through the week ending July 27. Clear weather prevailed except for a shower of .40 inch on the 26th. The maximum temperature for the week was 94, mean maximum 91.3; minimum 70, mean minimum 71.9; mean 81.6; greatest daily range 23 degrees. Three days were clear, three were partly cloudy, and one day was cloudy.

San Antonio (cont'd)

Cotton continues to make abundant plant growth. Boll weevil are causing all forms to shed, and it appears that no cotton will be produced on the station this season. Farmers report practically no cotton in their fields due to boll weevil and boll worms. The first bale of cotton from Bexar County was sold during the week. This was produced in the southern part of the county.

Corn is practically mature and husking will start soon. The second crop of forage sorghum is badly in need of moisture. The sorghum variety test was a complete failure due to birds and the sorghum midge. Most of the varieties were almost 100 per cent destroyed by the midge, and a few which produced some grain were further destroyed by birds. The experiment will be abandoned from the standpoint of yield.

Activities of the station during the week consisted of harvesting alfalfa and Johnson grass hay from fields C-4 and E-3; harvesting Sudan grass on rotation plot A6-18 and in the pasture at the farm residence; harvesting the sorghum variety test; plowing fallow and small grain stubble plots on field C-5 as scheduled; weeding orchards and vineyards A-3, B-3, and E-3; miscellaneous weeding; and care of grounds.

Mr. W. J. Gilmore, Chief of the Division of Agricultural Engineering, Oregon State Agricultural College, visited the station July 24.

I. M. Atkins.

Yuma

The maximum temperature for the week ending July 20 was 112.5, minimum 69, greatest daily range 43.5. Although every day in the week was partly cloudy, no precipitation was recorded. A rain at this time would be very unwelcome due to the large quantities of alfalfa seed now in the fields.

The most successful melon season in the history of the Yuma Valley is now being brought to a close. A total of 475 carloads have been shipped into eastern and middle western markets. Cantaloupes sold at a premium.

The latest available report of the Colorado River was for July 12 when the discharge was 36,000 second-feet. This is somewhat greater than it is at the present time.

During the past week the alfalfa seed on the station was cut. Milo plots in the rotations are being thinned to 15 inches and corn plots to 18 inches. The cotton plots were again hoed to rid them of sand burs.

The maximum temperature for the week ending July 27 was 110.5, minimum 73, and greatest daily range 32. No precipitation was recorded.

The first bale of cotton from the Yuma Valley this season was ginned on July 25. The bale, weighing 653 pounds, was obtained from 1800 pounds of seed cotton. This cotton was of the Mebane variety and of very good staple. The seed was planted on February 23, 1929.

The amount of water flowing in the Colorado River is still on the decline. On July 26 the discharge at Yuma was 20,000 acre-feet.

Yuma (cont'd)

During the past week the cutting of the fourth crop of hay was started. Milo and corn plots are still being thinned and hoed. Most of the alfalfa seed has been threshed.

Station visitors on July 23 were G. L. Crawford, of the Bureau of Agricultural Economics, U. S. Department of Agriculture, and S. L. Owens, County Agent of Yuma County.

Arthur T. Bartel.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol.XXXI August 3, 10, and 17, 1929 No. 16

Belle Fourche

For the week ending August 3 the maximum temperature was 98, minimum 48, and only a trace of precipitation.

The hauling of the second cutting of alfalfa was completed during the week, and the alfalfa in field A was irrigated.

Mr. Butler, of the Cereal office, visited the station on August 2, taking the notes on the uniform rust nursery. Considerable rust was found on some of the wheat and oat varieties, but as it came at a late date it had very little effect on the yields. The prolonged hot weather ripened the grain prematurely and the yields will be somewhat less than were expected.

Beyer Aune.

Huntley

During the two weeks ending August 17 the maximum temperature recorded was 99, minimum 47, and precipitation .17 inch.

The harvesting of dry-land winter wheat on the project is nearly completed. Due to the prevalence of drouth throughout the season, yields are generally low, ranging for the most part from 5 to 20 bushels per acre. The protein content is reported to be relatively high.

The harvesting of the second crop of alfalfa at the station was completed during this period.

Most of the irrigated grain at the station was harvested during this period and threshing of the dry-land varieties was begun.

Station visitors during the two weeks included President F. D. Farrell of the Kansas Agricultural College and J. A. Clark of the Cereal office. Messrs. M. W. Wolf, S. G. Ujansky, N. A. Burianenko, and B. N. Loubiako, agronomists from the agricultural college at Moscow, Russia, who are touring the western states by automobile, inspected the work of the station on August 7. On Monday, August 12, a party of tourists under the auspices of Wallace's Farmer, numbering between 200 and 250 men and women, were directed over the experimental plots.

Dan Hansen.

Newlands

Report for the three-week period ending August 3.

The meteorological data for July as compared to a 23-year average is as follows:

	1929	23-year average
Temperature, mean maximum	93.5	93.2
" , " minimum	53.5	54.0
" , mean	73.5	73.5
" , highest	97.0	100.5
" , lowest	44.0	43.7
Precipitation, inches	.02	.15
Wind velocity, miles per hour	2.20	2.79
Evaporation, inches	8.43	10.10

Newlands (cont'd)

	1929	23-year average
Days clear	28	23.5
" partly cloudy	1	4.6
" cloudy	2	2.9

The usual farm work, such as cultivating beets, corn, potatoes, and truck crops, has continued during this period. There have been two irrigations. All grain has been cut and is in the shock awaiting threshing, which will not be done until the second crop of hay has been cut and stacked.

Mr. C. S. Scofield, and Dr. W. P. Kelley of the Citrus Experiment Station at Riverside, California, were station visitors from July 31 to August 2, inclusive. Further plans were made regarding the boron research work. Several problems relative to this station were discussed, but final action will not be taken until the arrival of Mr. Hastings, who expects to visit the station sometime this month.

Mr. Cruz Venstrom, having resigned his position at this station, left for Reno, Nevada, on August 1 to engage in agricultural economic studies under Mr. F. B. Headley, Chief of the Office of Farm Development of the Nevada State Experiment Station. Mr. Lloyd Moon, who recently graduated from the University of Nevada, has taken the position at this station formerly filled by Mr. Venstrom.

E. W. Knight.

San Antonio

Report for the week ending August 3 and weather summary for July. Meteorological data were recorded as follows:

	Week ending August 3	Month of July	Average 1907-1928
Temperature:			
Maximum	97	95	---
Mean maximum	95	90.8	---
Minimum	69	69	---
Mean minimum	69.9	71.3	---
Mean	82.4	81.0	84.3
Greatest daily range ...	28	26	---
Precipitation, inches	0.0	3.12	1.66
Aspect of the sky, days:			
Clear	5	14	---
Partly cloudy	2	7	---
Cloudy	0	10	---
Evaporation, inches	---	6.79	8.99
Mean wind velocity	---	1.89	3.4*

*Average 1911-1928, inclusive.

The weather during the month of July was unusual in every way. The maximum temperature for the month, 95°, is 3° lower than the lowest maximum ever recorded at this station for July. Minimums were near normal, but the mean temperature was 3.3° below normal. Precipitation was considerably above normal and has been exceeded only three years of the twenty-two. Wind movement was considerably below the average, and evaporation from a free-water surface was also below normal.

San Antonio (cont'd)

During July corn and grain sorghums were matured. Corn suffered for moisture in June and the crop was reduced both in quality and quantity. Milo on the station produced a good crop, but would have yielded considerably higher had it not been for bird damage. Hay sorghums produced a good first crop. Cotton plant growth was excellent during July. On the station boll weevil destroyed all forms as fast as they appeared. Some cotton is set in farmers' fields, but it has been estimated that the production of the county will be less than one-fifth normal.

The weather of the past week has been very uniform, the thermograph charts showing a succession of even curves. The mean temperature was somewhat higher than in July but is somewhat below normal. Clear weather without even the usual cloudiness in the morning has been the rule.

Moisture samples of oats hay were weighed and yields computed for the rotation plots during the week. Milo in the rotation experiments was threshed and yields computed. Yields were slightly above the average, and the quality of grain is good. A table giving the yields of milo and another giving the yields of oats hay in the rotation experiments follow.

Yields of Milo in the Rotation Experiments, 1929

Plot	Rotation	Yield	Estimated bird damage	Rotation and cultural treatment
A4-12	A4-F	40.0	0%	Milo, field peas, plowed spring; sorgho, plowed Nov.; cotton, plowed fall; oats, plowed June.
A4-16	A4-G	30.4	2	Milo, field peas, hay, plowed spring; sorgho, plowed Nov.; cotton, plowed fall; oats, plowed June.
A5-1	A5-A	31.8	10	Milo, plowed July; oats, hay, plowed June; cotton, plowed Nov.
A5-4	A5-B	29.1	30	Milo, plowed July; oats, hay, plowed June; cotton, manure, plowed Nov.
A5-9	A5-C	41.6	5	Milo, plowed July; cotton, plowed fall; oats, grain, plowed June; cotton, plowed Nov.
A5-13	A5-D	34.0	20	Milo, manure, plowed July; cotton, plowed fall; oats, cowpeas, plowed fall; cotton, plowed fall.
A5-17	A5-E	19.6	40	Milo, manure, subsoiled July; cotton, plowed fall; oats, cowpeas, subsoiled fall; cotton, plowed fall.
A6-1	A6-1	10.2	65	Milo continuously, plowed July.
A6-2	A6-2	7.9	50	Milo, continuously, manure, plowed July.
A6-6	A6-1A	19.1	30	Milo, plowed July; oats, hay, plowed May.
A6-14	A6-D	18.9	50	Milo, plowed fall; corn, plowed July.
B4-15	B4-A	29.9	5	Milo, plowed July; Sudan grass, plowed Nov.; cotton, plowed Nov.
B4-18	B4-B	37.3	5	Milo, plowed July; oats, hay, field peas, plowed spring; cotton, plowed Nov.
B5-18	B5-E	18.1	5	Milo, plowed July; cotton, plowed Nov.
Average		26.3		

San Antonio (cont'd)

Yields of Oats Hay, Rotation Experiments, 1929

Plot	Rotation	Yield (Tons)	Rotation and cultural treatment
A5-2	A5-A	1.32	Oats, plowed June; cotton, plowed Nov.; milo, plowed July.
A5-5	A5-B	1.34	Oats, plowed June; cotton, manure, plowed Nov.; milo, plowed July.
A6-5	A6-1A	1.38	Oats, plowed May; milo, plowed July.
A6-8	A6-A	1.88	Oats, plowed May; corn, plowed July.
A6-10	A6-B	1.71	Oats, plowed Nov.; corn, plowed July.
A6-12	A6-C	1.63	Oats, subsoiled May; corn, plowed July.
B4-19	B4-B	1.63	Oats, field peas, plowed spring; cotton, plowed Nov.; milo, plowed July.
B5-7	B5-7	1.34	Oats continuously, plowed May.
Average		1.52	

Activities of the station consisted of harvesting Sudan grass from rotation plot A6-18; harvesting Johnson grass on C-4 and D-3; dusting cotton in fields C-6 and C-7 for leafworm control; threshing milo and the two latest time-of-planting flax plantings; disking rotation plots for weed control; plowing plots scheduled for July in the rotations; harvesting corn; weeding fallow plots; and care of the grounds.

Mr. Paul R. Dawson, Associate Biochemist, and J. J. Skinner, Senior Biochemist, Bureau of Chemistry and Soils, visited the station August 1 in connection with their cooperative work on rootrot control at this station.

Temperatures during the week ending August 10 more nearly approached normal for July and August. The maximum for the week was 98° and the mean maximum 97. Mean temperature for the week was 84.0 as compared to 84.7 mean for August for the last 22 years. Minimum temperature recorded was 65, mean minimum 71.0. The greatest daily range was 32°. No precipitation was recorded. During the week six days were clear, and one day was partly cloudy.

Activities of the station consisted of dusting all cotton for leafworm control, husking corn in the rotation experiments, plowing plots as scheduled, miscellaneous weeding, and care of the grounds.

Temperatures during the week ending August 17 have been very uniform and have run close to normal for this time of the year. The maximum temperature for the week was 101, mean maximum 98.7, minimum 67, mean minimum 70.6, mean 84.6, and greatest daily range 32°. No precipitation was recorded. Six days were clear and one was partly cloudy.

Corn harvesting was completed and although dry weights have not been obtained, field weights indicate that yields in the rotations will average between 35 and 40 bushels per acre, which is very good for this section. Yields in the variety test of corn are much lower due to poorer stands and weed growth. The quality of corn is good this season, damage from corn worm and weevil being relatively small.

San Antonio (cont'd)

Manure was hauled to plots in the rotations scheduled to be manured before plowing. Plowing of these plots and of the corn plots scheduled to be plowed immediately following harvest will be started next week.

Other work consisted of miscellaneous weeding; watering nurseries, grounds, and ornamentals; and general care of the grounds.

I. M. Atkins.

Yuma

The maximum temperature for the week ending August 3 was 106, minimum 70, greatest daily range 36, and precipitation .16 inch. This is the first rainfall we have had this year; in fact it is the first since October 30, 1928. The rather general rains in Arizona for the last two weeks have been of much value. The mean maximum temperature for the month of July was 106.1, mean minimum 73.4, and the mean daily range 32.7.

Yuma County is going to have a record cotton crop this year. Estimates show that between 34,000 and 36,000 bales will be produced, which is about 3,000 bales more than last year. This year's cotton is fruiting heavily and holding considerable of the crop now putting on.

The Colorado River has been rising during the past week due to the heavy rains in northern Arizona. The flow past Yuma was 29,000 acre-feet, an increase of 9,000 acre-feet during the past week.

Station work for the past week included the stacking of the fourth cutting of hay, cleaning ditches, cultivating milo and corn, and hoeing cotton and milo plots.

The maximum temperature for the week ending August 10 was 108, minimum 72, and greatest daily range 35. No precipitation was recorded.

Yuma Valley lettuce growers have started preparing their best land for the production of lettuce. Approximately 3,000 acres of land will be planted to lettuce soon. The University of Arizona is to cooperate with the growers in a series of fertilizer experiments in an effort to find a fertilizer that will produce an early crop and increase the quality of the lettuce.

Alfalfa seed growers seem to be very well satisfied in receiving 17 cents a pound for their seed this early in the season. Practically all the seed has been threshed.

Station work included the cultivation of milo and corn, hoeing plot borders, and hoeing ditch banks.

Mr. G. E. P. Smith, University of Arizona irrigation specialist, was a station visitor on August 5.

The maximum temperature for the week ending August 17 was 109, minimum 70, and greatest daily range 34. On August 12 .16 of an inch of rain fell and on August 16 .08 of an inch, making a total of .24 of an inch for the week.

Milo and corn in the rotations are making rapid growth. The

Yuma (cont'd)

present cultivation will probably be the last one that can be given without injury to the plants. Cotton bolls are beginning to open in some of the earlier plantings of cotton.

Station work for the past week included the cultivation of milo and corn, cleaning ditches, hoeing milo and corn plots, and hoeing borders in the rotations. All the date bunches on the Station are being covered with cheese-cloth sacks to protect them from the sun, bees, and dew.

Dr. J. H. Martin, in charge of Grain Sorghum Investigations, U. S. Department of Agriculture, was a station visitor on August 12.

Arthur T. Bartel.

W E E K L Y R E P O R T S
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Huntley

During the two weeks ending August 31 the maximum temperature recorded was 98, minimum 51, and precipitation 0.0. Hot winds have occurred almost daily during this period and the humidity has been unusually high.

Irrigation of alfalfa, beets, and potatoes occupied the major portion of station labor during the week ending August 31. Beans were harvested during this period.

The annual Huntley Project Fair was held in the park adjacent to the station on Saturday, August 31. The best exhibits from this fair are to be entered at the Billings Fair, which is to be held this year during the period September 2 to 6, inclusive.

Most of the week ending August 24 was utilized in threshing of both irrigated and dry-land grains. Yields of the irrigated grain from both the rotation experiments and miscellaneous tests are given in the following tables.

Yields of oats in the irrigated rotations in 1929

Rotation No.	Plot No.	Pounds per plot		Bushels per acre, grain	Ratio of grain to straw (pounds)
		Grain	Straw		
1	K- V-21	200	170	25.0	1 : 0.850
16	- 1	460	420	57.5	1 : 0.913
22	- 8	560	440	70.0	1 : 0.786
23	-16	570	570	71.3	1 : 1.000
24	- 9	500	410	62.5	1 : 0.820
25	- IV- 6	850	810	106.3	1 : 0.953
27	- V-20	340	450	42.5	1 : 1.324
28	-17	240	270	30.0	1 : 1.125
30	- IV-17	500	460	62.5	1 : 0.920
31	- III-15	510	640	63.8	1 : 1.255
32	- IV-20	370	260	46.3	1 : 0.703
42	- 8	820	1,010	103.5	1 : 1.232
44	-13	670	680	83.8	1 : 1.015
60	- III-12	830	830	103.8	1 : 1.000
61	- 6	1,110	1,520	138.8	1 : 1.369
1a	L- IV- 1	510	370	63.8	1 : 0.725
34	- 3	610	650	76.3	1 : 1.066
35	- 7	640	700	80.0	1 : 1.094
46	-11	740	820	92.5	1 : 1.108
64	-16	740	760	92.5	1 : 1.027
69	-23	900	1,120	112.5	1 : 1.244
Average		603	635	75.4	1 : 1.025

Huntley (cont'd)

Yields of Wheat in the Irrigated Rotations in 1929

Rotation No.	Plot No.	Pounds per plot		Bushels per acre, grain	Ratio of grain to straw (pounds)
		Grain	Straw		
3	K- V-23	140	220	9.3	1 : 1.571
18	- 4	550	610	36.7	1 : 1.109
28	-18	170	240	11.3	1 : 1.412
37	L- I- 2	550	670	36.7	1 : 1.218
47	-10	470	600	31.3	1 : 1.277
49	- 6	620	710	41.3	1 : 1.145
Average		417	508	27.8	1 : 1.289

Yields of Barley in Field O, 1929

Plot No.	Pounds per plot		Grain, bushels per acre	Ratio of grain to straw (pounds)
	Grain	Straw		
O-IV- 1	1,390	880	92.5	1 : 0.775
- 2	1,060	770	88.3	1 : 0.726
- 3	1,010	690	84.2	1 : 0.683
- 4	1,080	760	90.0	1 : 0.704
- 5	1,110	760	92.5	1 : 0.685
- 6	1,010	750	84.2	1 : 0.743
- 7	1,020	760	85.0	1 : 0.745
- 8	1,110	840	92.5	1 : 0.757
- 9	1,230	960	102.5	1 : 0.780
- 10	1,120	920	93.3	1 : 0.821
- 11	1,120	870	93.3	1 : 0.777
Average	1,089	813	90.8	1 : 0.745

Yields of Barley in Field L-II, 1929

Plot No.	Pounds per plot		Grain, bushels per acre	Ratio of grain to straw (pounds)
	Grain	Straw		
L-II- 14	1,210	720	100.8	1 : 0.595
- 15	1,120	790	93.3	1 : 0.705
- 16	1,110	770	92.5	1 : 0.694
- 17	1,150	810	95.8	1 : 0.704
- 18	1,160	790	96.7	1 : 0.681
- 19	1,160	850	96.7	1 : 0.733
- 20	1,160	880	96.7	1 : 0.759
Average	1,153	801	96.1	1 : 0.696

Huntley (cont'd)

Yields of Wheat in Variety Test, Field L-II, 1929

Plot No.	Variety	Pounds per plot		Bushels per acre, grain	Ratio of grain to straw (pounds)
		Grain	Straw		
L-II-3-a	Marquis	103	117	45.8	1 : 1.136
-b	Ceres	118	172	52.4	1 : 1.458
-c	Hope	121	169	53.8	1 : 1.397
-d	Reliance	142	158	63.1	1 : 1.113
-e	Supreme	112	118	49.8	1 : 1.054
-4-a	Kubanka	118	162	52.4	1 : 1.373
-b	Nodak	120	180	53.3	1 : 1.500
-c	Marquillo	127	163	56.4	1 : 1.283
-d	Reward	106	144	47.1	1 : 1.358
-e	Mindum	125	185	55.6	1 : 1.480
-5-a	Pringle Champlain	143	187	63.6	1 : 1.308
-b	Marquis	125	155	55.6	1 : 1.240
-c	Ceres	117	173	52.0	1 : 1.479
-d	Hope	123	167	54.7	1 : 1.358
-e	Reliance	123	147	54.7	1 : 1.195
-6-a	Pringle Champlain	139	191	61.8	1 : 1.374
-b	Supreme	113	127	50.2	1 : 1.124
-c	Kubanka	133	177	59.1	1 : 1.331
-d	Nodak	138	192	61.3	1 : 1.391
-e	Marquillo	116	174	51.6	1 : 1.500
-7-a	Reward	102	138	45.3	1 : 1.353
-b	Mindum	129	191	57.3	1 : 1.481
-c	Pringle Champlain	154	236	68.4	1 : 1.532
-d	Marquis	119	201	52.9	1 : 1.689
-e	Ceres	125	145	55.6	1 : 1.160
-8-a	Hope	126	184	56.0	1 : 1.460
-b	Reliance	157	213	69.8	1 : 1.357
-c	Supreme	129	171	57.3	1 : 1.326
-d	Kubanka	152	238	67.6	1 : 1.566
-e	Nodak	148	222	65.8	1 : 1.500
-9-a	Pringle Champlain	155	215	68.9	1 : 1.387
-b	Marquillo	124	176	55.1	1 : 1.419
-c	Reward	107	123	47.6	1 : 1.150
-d	Mindum	148	212	65.8	1 : 1.432
-e	Pringle Champlain	150	250	66.7	1 : 1.667
Average of					
5 plots	Pringle Champlain	148	216	65.9	1 : 1.454
3 "	Reliance	141	173	62.5	1 : 1.222
3 "	Nodak	135	198	60.1	1 : 1.463
3 "	Mindum	134	196	59.6	1 : 1.464
3 "	Kubanka	134	192	59.6	1 : 1.423
3 "	Hope	123	173	54.8	1 : 1.405
3 "	Marquillo	122	171	54.4	1 : 1.401
3 "	Supreme	118	159	52.4	1 : 1.168
3 "	Ceres	120	163	53.3	1 : 1.366
3 "	Marquis	116	158	51.4	1 : 1.355
3 "	Reward	105	135	46.7	1 : 1.287

Size of plots: .0375 acre each.

Huntley (cont'd)

Yields of Flax in the Irrigated Rotations in 1929

Rotation No.	Plot No.	Pounds per plot Grain	Pounds per plot Straw	Bushels per acre, grain	Ratio of grain to straw (pounds)
9	K-III-16	60	130	4.3	1 : 2.167
67	- II- 6	320	620	22.9	1 : 1.938
Average		190	375	13.6	1 : 2.053

Dan Hansen.

San Antonio

Meteorological data recorded during the week ending August 24 were as follows: Maximum temperature 98, mean maximum 96.6; minimum 70, mean minimum 71.0; mean 83.8; greatest daily range 27 degrees. Seven days were recorded as clear. No precipitation was recorded.

The weather continues hot and dry. No precipitation has been recorded for almost a month. Forage crops are making very little second growth. Cotton plants have also stopped growth. Calcium arsenate applied to the station cotton during the week ending August 10, to control the cotton leaf worm, appears to have been effective also in reducing the boll weevil population inasmuch as numerous open flowers are now to be seen.

Summer plowing of rotation plots continued during the week. Fallow ground in the rotations and in the rootrot-fallow experiment on C-5 was disked for weed control. Other activities consisted of mowing Sudan grass on B4-16 and Johnson grass on fields A-7 and along the sewer line fence on C-6; cutting all corn stalks; cultivating orchards A-3, B-3, and E-3; miscellaneous weeding; and care of nurseries and grounds.

Report for the week ending August 31 and weather summary for August.

Meteorological data were recorded as follows:

	Week ending August 31	Month of August	22-year average
Temperature:			
Absolute maximum	102	102	---
Mean maximum	98.1	97.5	---
Absolute minimum	67	65	---
Mean minimum	70.7	70.6	---
Mean	84.4	84.1	84.7
Greatest daily range ...	33	33	---
Precipitation, inches	.05	.05	1.53
Aspect of the sky, days:			
Clear	7	29	---
Partly cloudy	0	2	---
Cloudy	0	0	---
Mean wind velocity	---	2.0	3.2
Evaporation, inches	---	6.52*	9.13

*Evaporation tank was out of order August 3 to 9, inclusive.

San Antonio (cont'd)

Important features of the weather of August were the unusually large number of clear days, low wind movement, low rainfall, and slightly below normal mean temperature. Crop conditions were unfavorable the entire month. Forage crops have suffered for lack of moisture and made very little growth during the month. Corn was harvested and all summer plowing completed. Cotton boll weevils continue to be present in abundance in spite of the hot, dry weather.

Activities of the station during the past week have been as follows: Completion of summer plowing in the rotation experiments; graveling the driveway at the farm residence; hauling the stover from the sorghum variety test; plowing out Bermuda grass where it is encroaching on garden and nurseries; miscellaneous repair work; and care of the grounds and nurseries.

I. M. Atkins.

Yuma

The maximum temperature for the week ending August 24 was 108, minimum 73, and greatest daily range 34. Precipitation for the week totalled 0.22 of an inch.

The cotton plots that received ammo-phosphate at the rate of 125 pounds per acre on July 1 are lodging. This seems to be caused by increased height and amount of foliage.

To date approximately 250 bales of cotton have been ginned in the Yuma Valley. The entire cotton crop seems to be somewhat later than last year, as 1,973 bales had been ginned by this time in 1928.

Station work for the week included the cutting of the fifth crop of alfalfa hay, cultivating milo and corn, and hoeing plot borders. The alfalfa hay contains a great deal of water grass and is of poor quality.

Dr. A. E. Longley, of the Biophysical Laboratory, U. S. Department of Agriculture, was a station visitor August 21.

The week ending August 31 was considerably warmer than any other part of the month. The maximum temperature was 114.5, minimum 73, greatest daily range 38.5, and precipitation 0.50 inch. The mean maximum temperature for the month of August was 104.9, mean minimum 75.4, maximum 114.5, minimum 70, and total precipitation 0.96 inch. This is the first normal monthly precipitation we have had since December 1927.

A rather severe storm swept through this section on the evening of August 30. Although numerous trees were uprooted or broken off, the damage to the crops was slight.

The Double Dwarf variety of milo on the rotations is now heading freely. The second crop of alfalfa seed is in full bloom and is beginning to curl in places. Many of the earlier dates on the Station are starting to ripen.

Mr. C. S. Scofield and Dr. W. P. Kelley arrived at the Station on the evening of August 27 and left on the morning of August 29. Dr. Kelley is Professor of Agricultural Chemistry of the University of California at Riverside.

Arthur T. Bartel.

M I S C E L L A N E O U S

The galley proof of Technical Bulletin No. 144, "Irrigated Crop Rotations in Southern Montana," by Stephen H. Hastings, Senior Agronomist, and Dan Hansen, Associate Agronomist, has been read and was returned to the office of the Bureau editor on September 7.

Circular No. 70, "Work of the Huntley Field Station, Montana, in 1925 and 1926," by Dan Hansen, Office of Western Irrigation Agriculture; A. E. Seamans, Office of Dry-Land Agriculture; and David A. Savage, formerly with the Office of Western Irrigation Agriculture, has been printed and is being distributed.

Mr. C. S. Scofield returns to Washington on September 16 from California where he has been for some weeks.

Mr. S. H. Hastings returned to Washington on August 15 from an extended field trip.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI September 7, 14, and 21, 1929 No. 18

Huntley

The first killing frost of the season occurred during the three-week period ending September 21, the minimum temperature reaching 25 on September 8. This frost did some damage to late beans and other tender crops. The maximum temperature recorded during this period was 96 (week of September 7), minimum 25 (week of September 14), and precipitation .37 inch (.30 inch week of September 14 and .07 inch the following week).

This season was one of the driest on record since the station was established. The total rainfall from May 1 to September was 3.33 inches as compared to the normal for this period of 6.93 inches.

Beans in plot O-I-9 (maximum crop series) were threshed on September 21. The yield from this one-fourth acre plot was at the rate of 2,932 pounds to the acre. Beans in the variety test in plots O-II-6 to 9, inclusive, were also threshed on this date, and the yields obtained are reported in the following tables.

Yields of Beans in Variety Test, Field O, 1929

Plot No.	Variety	Yield, pounds per plot	Stand, plants per plot	Date of maturity
O-II-6-a	Great Northern	71	934	8-30
-b	Navy	34	886	8-29
-c	Pinto	74	1020	do
-d	Early Wonder	53	740	8-30
-e	1000 to 1	49	712	do
-f	Early Prolific	67	862	do
-g	Robust	57	850	do
-h	Great Northern(Idaho Certified)	70	884	8-29
-7- a	Great Northern	75	800	do
-b	Navy	44	710	8-27
-c	Pinto	79	998	8-29
-d	Early Wonder	51	420	8-31
-e	1000 to 1	50	460	do
-f	Early Prolific	65	640	do
-g	Robust	55	406	do
-h	Great Northern(Idaho Certified)	69	774	do
Avg. of 2 plots	Great Northern	73	867	
	Navy	39	798	
	Pinto	76.5	1009	
	Early Wonder	52	580	
	1000 to 1	49.5	586	
	Early Prolific	66	751	
	Robust	56	628	
	Great Northern(Idaho Certified)	69.5	829	

Two-row plots, each row 272¼ feet long.

Huntley (cont'd)

Yields of Beans in Variety Test, Field O, 1929

Plot No.	Variety	Yield, pounds per plot	Stand, plants per plot	Date of maturity
O-II-8-a	Great Northern	42	393	8-31
-b	Cornell No. 63	24	395	do
-c	Navy	28	287	do
-d	Cornell No. 11	17	305	do
-e	Great Northern	47	433	do
-f	Cornell No. 35 D	19	178	do
-g	Navy	29	287	do
-h	Cornell No. 28	22	349	do
-i	Great Northern	40	362	do
-j	40520	38	303	do
-k	Navy	19	221	do
-l	York	26	482	do
-m	Great Northern	35	302	8-30
-n	Geneva	31	447	do
-o	Navy	26	317	8-29
-p	Arikara	32	455	8-27
-9-a	Great Northern	32	342	8-29
-b	Brown or Swedish	25	491	8-27
-c	Navy	17	291	do
-d	Boston Yelloweye	18	486	8-29
-e	Great Northern	40	488	8-27
-f	Refugee	19	430	8-31
-g	Navy	20	269	8-27
-h	Hodson Wax	12	213	8-31
-i	Great Northern	43	385	8-27
-j	Curries Rustproof Black Wax	19	361	do
-k	Navy	27	342	do
-l	Dwarf horticultural	24	341	8-31
-m	Great Northern	47	404	8-27
-n	Robust	27	204	8-29

One-row plots, each row 272½ feet long.

The average yield of beans will probably be less than in former seasons, although the price is exceptionally high. Early sales brought as much as $8.00 per hundredweight, while the market price at present is $6.75 to $7.00. While yields in exceptional cases have been reported as high as 20 hundredweight per acre, the average will probably be from 12 to 15 hundredweight.

Much less than the average acreage of winter wheat on dry lands has been seeded to date due to continued conditions of drouth, and it is probable that considerable land will be carried over for spring seeding. Seeding of fall grains on the station dry-land plots was completed during the week ending September 21

Harvest of crops on the station is nearing completion. Beets and potatoes have yet to be harvested and the third cutting of alfalfa in the plot variation test in Fields B-II and B-III remains to be hauled in.

Huntley (cont'd)

The harvest of sugar beets in the local territory will begin on September 24. Beet deliveries until October 1 will be restricted to amounts that can be loaded in cars. After that date, silo piles will be started. The harvest acreage for the local factory amounts to slightly more than 19,000 acres and there is indication that the yield will be somewhat above average.

The third cutting of alfalfa hay in the rotation experiments was hauled in from the fields and placed in the dairy barn during the last week of the period covered by this report. Yields in pounds per plot and in tons per acre for the season's three cuttings are given in the following table.

Yields of Alfalfa in the Irrigated Rotations, Fields K and L-IV, 1929

Rotation No.	Plot No.	Age, years	Yields: Pounds per plot: 1st crop	2d crop	3d crop	Total	Tons per acre: 1st crop	2d crop	3d crop	Total
8a	K- IV-22	1*	570	430	---	1000	1.14	0.86	---	2.00
40	- 1	2	1160	1110	890	3160	2.32	2.22	1.78	6.32
40	-14	1	320	580	---	900	0.64	1.16	---	1.80
42	- 7	2	1110	1190	930	3230	2.22	2.38	1.86	6.46
42	-10	1	650	640	---	1290	1.30	1.28	---	2.58
44	-11	2	890	940	810	2640	1.78	1.88	1.62	5.28
44	-14	1	350	540	590	1480	0.66	1.08	1.18	2.92
60	-III- 8	1	650	680	---	1330	1.30	1.36	---	2.66
60	- 9	2	1040	1130	940	3110	2.08	2.26	1.88	6.22
60	-10	3	960	1050	830	2840	1.92	2.10	1.66	5.68
61	- 2	1	290	880	---	1170	0.58	1.76	---	2.34
61	- 3	2	1190	1270	1100	3560	2.38	2.54	2.20	7.12
61	- 4	3	1050	1250	1090	3390	2.10	2.50	2.18	6.78
67	- II- 2	1	620	830	---	1450	1.24	1.66	---	2.90
67	- 3	2	1190	1220	980	3390	2.38	2.44	1.96	6.78
67	-14	3	"hogged off"							
8aa	L- IV-14	14	650	820	670	2140	1.30	1.64	1.34	4.28
46	-10	1	290	620	600	1510	0.58	1.24	1.20	3.02
46	-13	2	900	930	770	2590	1.80	1.84	1.54	5.18
64	-15	1	210	440	430	1080	0.42	0.88	0.86	2.16
64	-19	3	1030	1110	770	2910	2.06	2.22	1.54	5.82
64	-20	2	750	960	670	2380	1.50	1.92	1.34	4.76
69	-22	1	350	660	700	1710	0.70	1.32	1.40	3.42
69	-26	3	"hogged off"							
69	-27	2	880	960	680	2520	1.76	1.92	1.36	5.04
Average			743	880	791	2307	1.49	1.76	1.58	4.41

*Reseeded spring of 1929.

Dan Hansen.

Newlands

The following meteorological data were recorded for the five-week period ending September 21: Mean maximum 86, maximum 95; mean minimum 47, minimum 31 on September 9. There was .01 inch of rainfall on August 25 and .01 inch again on August 30, making a total of .02 inch for the period.

During this period the farm work has consisted of cultivating beets, threshing grain, cutting ensilage corn and filling the silo, and harvesting the second crop of hay. The yields obtained from the various plots of grain and ensilage corn are given in the following tables.

Yields of Grain, 1929

Plot	Area	Crop	Actual yield		Yield per acre	
			Straw and grain	Grain	Straw and grain	Grain
	Acre		Pounds	Pounds	Pounds	Pounds
D- 4	.34	Wheat	1,255	540	3,691	1,588
8	.50	Wheat	1,135	435	2,270	970
E- 3	.58	Wheat	2,460	1,035	4,241	1,784
4	.59	Wheat	880	385	1,492	653
5	.57	Wheat	850	360	1,491	632
6	.54	Wheat	1,885	775	3,491	1,435
F- 6	.52	Barley	1,530	605	2,942	1,163
8	.52	Wheat	830	335	1,596	644
Y- 6	.45	Oats	900	247	2,000	549
7	.45	Oats	1,035	249	2,300	553
8	.45	Oats	920	174	2,044	387
9	.45	Wheat	1,285	390	2,856	867
10	.45	Wheat	1,350	425	3,000	944
18	.45	Wheat	1,075	305	2,389	678

Yields of Ensilage Corn, 1929

Plot	Area	Actual yield	Yield per acre
	Acre	Pounds	Pounds
D-7	.51	6,640	13,020
E-1	.61	9,340	15,311
2	.57	6,095	10,693
7	.49	3,965	8,092
8	.72	7,520	10,444
F-5	.52	9,005	17,317

Two general irrigations were given during this period, the one on August 23 and 24 being the last for the season due to a shortage of water. All farmers were allowed one irrigation for their third crop of hay. Any surplus after this irrigation was distributed as fairly as the District Board was able to do.

The Superintendent was absent from the station during a part of this period. He visited the laboratories at Santa Paula and at Riverside, California. At Santa Paula several days were spent in the laboratory with Mr. Wilcox for the purpose of learning his method of boron analysis. Some time was spent among the walnut and citrus groves of

Newlands (cont'd)

the surrounding country with Mr. Wilcox to observe and become familiar with the symptoms of boron injury and the extent of this problem in that locality. Two days were spent with Mr. Eaton and Mr. Blair at Riverside. The work these men are doing with culture solutions containing boron salts on various plant seedlings proved to be highly interesting.

The Citrus Experiment Station at Riverside was visited, also citrus groves in the surrounding country. Some time was spent with Mr. Thomas of the chemical staff of Dr. Kelley's laboratory. Problems of land reclamation were discussed, and some pot experiments in reclamation and field fertilization experiments were observed.

E. W. Knight.

San Antonio

For the week ending September 7 meteorological data were recorded as follows: Maximum temperature 99, mean maximum 97.4; minimum 68, mean minimum 74.4; mean 85.9; and greatest daily range 28 degrees. Aspect of the sky: Two days were clear and five were partly cloudy. No precipitation was recorded.

The mean temperature for the past week was higher than any other week during the summer. The mean temperature for August for the past 22 years is 84.7 and for September 79.6. Dry, clear weather continues to prevail, although many sections of the State have received rains.

No change in crop conditions has occurred since last week. Cotton in the rotation experiments was picked during the week, although the amount of cotton did not justify the labor required. The largest amount picked from any of the quarter-acre plots was 15 pounds of seed cotton.

Activities of the station other than picking cotton consisted of plowing field C-3 and part of D-3, hauling and sawing wood, taking soil samples of cotton plots, miscellaneous weeding, and care of nurseries and grounds.

I. M. Atkins.

Meteorological data recorded for the week ending September 14 are summarized as follows: Maximum temperature 100, mean maximum 94.7; minimum 65, mean minimum 70; greatest daily range 34; and mean temperature 82.4. Three days were clear, two were cloudy, and two were partly cloudy. The first precipitation of more than 0.1 inch in the past seven weeks occurred the night of the 13th when a total of 1.16 inches was received. This will check the deterioration of pastures and prevent further shedding of leaves by fruit and ornamental trees on dry land.

Clearing an area of about one-fourth acre along Six Mile Creek on A-7 was started. It is planned to use this land for a planting of several varieties of bamboos received and set in the nursery the past winter.

A series of short diversion terraces were thrown up in the field road at the west side of A-6 in an attempt to prevent further erosion in that area.

San Antonio (cont'd)

Second-crop row sorgo on five rotation plots was harvested. The crop headed very short owing to the drought, the plots averaging from 30" to 44" tall, and the plants were firing badly.

The plowing of field D-3 was completed. About four-fifths of the north half of B-4 was also plowed. Johnson grass was chopped from cotton plantings in the rotations, in C-5, and in the Herbst tract.

Geo. T. Ratliffe.

Yuma

The week ending September 7 was decidedly cool for this time of the year. The maximum temperature was 101, minimum 65, greatest daily range 28, and precipitation 1.55 inches. A rain that measured 1.41 inches fell on September 2, and since then lower temperatures have prevailed.

Field work was slowed down because of the rain the first of the week. Much of the time was spent in cleaning up trees and branches that were broken during last week's storm. Small mesquite trees are rather numerous on certain parts of the station. These are being dug up and burned.

One thousand seven hundred and eighty-eight bales of cotton have been ginned this season in the Yuma Valley. Although the recent rains and storms temporarily stopped cotton picking, the operations are now again in full swing.

A delegation of five Russian scientists headed by Prof. M. M. Wolf, Timiriazeff Agricultural Academy, Moscow, Russia, visited the station on September 5. Their interest was centered largely on the methods used in the production of cotton and the yields as affected by different rotations.

The maximum temperature for the week ending September 14 was 111.5, minimum 60, and greatest daily range 50.5. No precipitation was recorded. All days in the week were clear.

The dates have been ripening rapidly and picking was started the past week. Attempts are made to cure artificially those that do not ripen well on the trees. The rain we had last week caused many of the earlier dates to sour and fall from the trees.

The Sudan grass that was planted July 9 has been cut and shocked. The growth was exceptionally tall and yet it was not coarse.

The maximum temperature for the week ending September 21 was 109, minimum 64, greatest daily range 45, and precipitation 0.30 inch. On September 18 Yuma reported a day with no sunshine, a condition which seldom occurs.

Yuma Valley's cotton ginning report showed that 4,906 bales of cotton have been ginned so far this season. At this time in 1928 a total of 9,315 bales had been ginned. The temporary labor shortage has somewhat retarded the picking of cotton during the past week. Arrangements are being made, however, to supply the farmers with the needed laborers.

The Sudan grass yielded very well. The three acres averaged 2.7 tons per acre. One plot yielded 3.4 tons per acre. The Double Dwarf milo in the rotations is beginning to ripen. The heads seem to be very well filled out.

Arthur T. Bartel.

Prosser

THE SALT BALANCE BETWEEN THE INFLOW OF IRRIGATION WATER AND THE OUTFLOW OF DRAINAGE WATER ON THE WAPATO, WASHINGTON, RECLAMATION PROJECT DURING THE SEASON OF 1928-1929

With the cooperation of the U. S. Indian Irrigation Service at Wapato, Washington, weekly samples of the drainage water from the Wapato Project were collected from April 1928 to March 1929. The irrigated area of the Wapato Project in 1928 includes 78,480 acres. This area is a comparatively level fan-shaped stretch of land situated on the south side of the Yakima River between the towns of Satus and Parker. This entire area is underlaid with a gravelly subsoil which ranges in depth and thickness from a few inches to 35 or 40 feet. It is served by a fairly complete drainage system, the laterals and sublaterals of which all finally lead into one large open drain. The samples of drainage water and the discharge readings were taken from this main line drain at a gaging station which is below the point where the last lateral empties into it.

The total salts (electrolytes) in each of these samples were determined by the conductance method and a conversion table (No. 2/28). Forty-six samples were collected during the year from the main drain at the gaging station mentioned above. The average salt content of these samples was 214 p.p.m.* The lowest reading on any of the samples was 152 p.p.m. and the highest was 293 p.p.m.

During the year 22 samples (approximately two each month) of irrigation water were taken from the Sunnyside Canal as it flows through the Prosser Experiment Station. The diversion dam for the Sunnyside Canal on the Yakima River is about one-half mile below the dam for the Wapato Canal, and it is thought that the quality of the water in the two canals is practically identical. Therefore, the samples were taken at the Experiment Station as a matter of convenience. These samples showed an average salt content of 64 p.p.m. The lowest reading was 50 p.p.m. and the highest 70 p.p.m.

The amount of water in acre-feet delivered each month to the lands on the Wapato Project and the amount flowing in the main drain were obtained from the Wapato office of the Indian Irrigation Service. These figures appear in the first column of Table 1.

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*p.p.m. == parts per million.

Prosser (cont'd)

Table 1.- Monthly amounts, in acre-feet, of irrigation water delivered to the Wapato Project in 1928, and corresponding quantities of total salts.

Month	Acre-feet	Mean T.S.* p.p.m.	Pounds salt per acre-foot	T.S.* carried (tons)	T.S.* pounds per acre
March	1,545	64	174	134.5	3.0
April	33,407	70	191	3,190	81
May	114,138	50	136	7,765	198
June	109,642	67	182	10,000	256
July	92,188	66	179	8,263	211
August	89,663	63	171	7,670	195
September	45,550	67	182	4,145	101
October	27,231	64	174	2,370	62
Total	513,364			43,537	1,107

Monthly amounts, in acre-feet, of drainage water discharged by main drain, Wapato Project, 1928-29 and corresponding T.S.*

1928					
April	12,187	230	625	3,800.0	97.0
May	18,534	210	570	5,282	135
June	30,171	204	554	8,792	224
July	34,057	198	538	9,160	234
August	29,971	210	570	8,540	218
September	27,343	208	566	7,740	197
October	24,651	190	517	6,370	162
November	20,301	203	552	5,601	143
December	17,883	217	490	5,280	135
1929					
January	13,856	212	576	3,990	101
February	10,679	251	683	3,645	93
March	14,821	225	612	4,535	115
Total	234,454			72,535	1,854

Note: 72,535 tons minus 43,537 tons == 27,998 tons total salts.

1,854 pounds minus 1,107 pounds == 747 pounds per acre.

*T.S. represents total salts (electrolytes) as determined by the electrolytic bridge.

With these amounts and the monthly means of the salt content of the samples taken each month, the total pounds of salt carried into the project by the irrigation water and the total amount carried out by the drainage water was computed. These totals are given by months in Table 1. During the season of 1928, 78,480 acres of land were irrigated and 513,364 acre-feet of water were diverted. This amounts to a

Prosser (cont'd)

little more than 6½ acre-feet per acre irrigated. The main drain discharged 254,454 acre-feet of water, which amounts to 3.2 acre-feet per acre. The total inflow of salt for the season was 43,537 tons, which equals 1,107 pounds per acre, and the total outflow of salt was 72,535 tons or 1,854 pounds per acre.

These results indicate that the drainage water carried away from the project in 1928, 27,998 tons more salt than was brought in by the irrigation water, or a net removal of 747 pounds of salt per acre.

A composite sample of the drainage water and a sample of the irrigation water were sent to Mr. Breazeale at Tucson, Arizona, for regular analyses. The results are given in Table 2.

Table 2.- Results in p.p.m. of analyses of drainage and irrigation water.

Sample	Total salts (T.S.)	Calcium (Ca)	Magnesium (Mg)	Carbonate (CO_3)	Bicarbonate (HCO_3)	Chloride (Cl)	Sulphate (SO_4)	Nitrate (NO_3)
Drainage water	208	54	6	0	240	tr.	10	0
Irrigation water	96	21	0	0	72	14	10	0

It will be noticed in this table that the total salts found in the drainage water by Breazeale are 208 p.p.m., while the average of the 46 samples referred to above was 214 p.p.m., which is very close.

The bulk of the acid constituents found in this drainage water seems to be in the bicarbonate form, and the same is true of the irrigation water, while calcium represents the largest amount of the basic ions determined. It is probable that sodium makes up a large proportion of the undetermined basic ions.

C. C. Wright.

MISCELLANEOUS

Circular No. 69 entitled "Work of the Newlands Field Station, Nevada, 1924-1927", by E. W. Knight, Assistant Agronomist and Superintendent, has recently been issued.

W E E K L Y R E P O R T S
Of The Office Of
WESTERN IRRIGATION AGRICULTURE

Vol. XXXI September 28, October 5, 12, and 19, 1929 No. 19

San Antonio

Report for the four-week period ending October 12.
Meteorological data were recorded as follows:

	Week ending		Month of	Week ending	
	Sept. 21	Sept. 28	Sept.	Oct. 5	Oct. 12
Temperature					
Absolute maximum	89	95	100	98	91
Mean maximum	87.6	90.3	92.6	94.1	88.6
Absolute minimum	59	58	58	59	56
Mean minimum	64.3	61.6	67.6	63.6	63.9
Mean	76.0	75.9	80.1	78.9	76.2
Greatest daily range	30	30	34	37	33
Precipitation (inches)	1.22	----	2.38	----	.27
Aspect of the sky(days)					
Clear	4	7	17	6	5
Partly cloudy	2	0	10	1	2
Cloudy	1	0	3	0	0

The summer drouth which started about the middle of July has continued to the present time with the exception of two small rains on September 13 and 14. These rains relieved crops and ornamentals only temporarily, and very little fall growth has been made. The weather during September was unusually clear, 17 clear days being recorded; 10 were partly cloudy and 3 cloudy. The mean temperature for the month of 80.1 was only slightly above the 22-year average of 79.6.

Crop conditions were unfavorable throughout August and September. Forage crops made practically no growth and seeding of small grains for pasture has been impossible because of lack of moisture. Boll weevil prevailed throughout the summer and destroyed all squares produced by the cotton. Abundant early summer rainfall supplied sufficient moisture so that rootrot spread rapidly in many plots early in the season. This spread was almost completely checked by drouth in late August and early September, but since the rains of September 13 and 14 rootrot is again spreading rapidly.

Fall gardens have produced very little in this section. Tomatoes on the station, carried through the summer to produce a fall crop, have set practically no fruit. Ornamentals and orchard trees have lost many leaves and present a poor appearance. A tree of Okame Japanese Persimmon on the station has a heavy crop of fruit, the first in several years. It was necessary to cover the tree with mosquito netting to prevent destruction of the fruit by birds.

The 15-30 McCormick-Deering tractor arrived September 23 and has been used to advantage in plowing fields AB-8, BC-3, the pistache orchard on D-4, and the lower pasture. Field D-4 and the remainder of field D-4 was plowed with the mule-drawn plow.

San Antonio (cont'd)

The seedbed was prepared and wheat seeded in the lower pasture but to date it has not emerged because of insufficient moisture.

All fallow plots on A-4 and on C-5 were disked for weed control and were also hand weeded.

The soil-saving dam along the east line of field E-3 was repaired.

The heating system of the greenhouse was inspected and repaired. Miscellaneous repair work, care of orchards, nurseries, and grounds occupied the remainder of the time.

Mr. Paul R. Dawson, Associate Biochemist, Bureau of Chemistry and Soils, Austin, Texas, spent September 18 and 19 at the station. Mr. W. H. Tisdale, formerly of the Office of Cereal Crops and Diseases, Pathologist for the Bayer-Semesan Company, Wilmington, Delaware, was a station visitor October 11.

Mr. Hastings arrived from Washington October 9. On October 11 Messrs. C. B. Doyle, R. L. Taylor, and H. C. McNamara, all of the Office of Cotton, Rubber, and Other Tropical Plants, arrived from Greenville, Texas, and were joined by Mr. Hastings and Mr. Ratliffe in a three-day trip through southern Texas, including Corpus Christi, Lower Rio Grande Valley, and Laredo sections.

For the week ending October 19 meteorological data were recorded as follows: Maximum temperature 87, mean maximum 83.3; minimum 58, mean minimum 61.9; mean 72.6; greatest daily range 29; precipitation .60 inch. Five days were clear, one was partly cloudy, and one cloudy. Typical fall weather was experienced during the week. The nights were quite cool, although it still is quite warm through the middle of the day. Two light "northers" blew in during the week. The first came on the 14th and lasted two days, the maximum temperature on the 15th being 71. During the two days .37 inch of rainfall was recorded. Another shower of .23 inch was recorded the night of the 19th. These showers will be of benefit in putting seedbeds in condition for fall planting as well as providing moisture for germination of small grains which have been sown.

Final counting of rootrot and detailed mapping of all infected areas in cotton fields was started during the week.

Cotton stalks were mowed on fields C-5 and F-3 to clear the land for plowing.

The center bench in the greenhouse was torn out; it will be replaced with new material.

The drilled sorghum plots were mowed. Sorghum had made practically no growth since August, and a very small second crop was produced.

The seedbed was prepared and rye planted for green manure on plot B6-17.

I. M. Atkins.

Yuma

The maximum temperature for the week ending September 28 was 98, minimum 55, and greatest daily range 40. No precipitation was recorded. All the days in the week were clear.

Yuma (cont'd)

During the past week 2,192 bales of cotton were ginned in the Yuma Valley. This makes a total of 7,098 bales that have been ginned this season. Numerous cotton pickers have been obtained from the Coast cities, thus taking care of the labor shortage that existed.

Cotton on the station is looking very well, Between one-half and three-fourths of the bolls are open. The first picking of cotton will start very soon.

The cutting of the second crop of alfalfa seed has started. This crop seems to be very poor in that the plants have but few curls and many of the curls that did form contain no seed. This is especially true with the alfalfa seed in the rotations.

The maximum temperature for the week ending October 5 was 106, minimum 60, and greatest daily range 42.5. No precipitation was recorded. The temperatures for the month of September are as follows: Mean maximum 98.2, mean minimum 66.0, maximum 111.5, minimum 55.0, and greatest daily range 50.5. The total precipitation was 1.85 inches, which is considerably greater than the 20-year average of 0.524 inch.

The picking of cotton on the station was started last week. One plot containing Sakel x Pima 33 and Pima 5-3 has been picked. The ends of many cotton plots are being damaged by caterpillars, which eat the leaves and also cause much of the cotton to fall to the ground.

Some of the alfalfa seed has been threshed and the yields are very poor, even lower than field observations seemed to indicate. The second crop of alfalfa seed seems to be rather poor throughout the Yuma Valley.

Messrs. T. H. Kearney and George J. Harrison, of the Office of Egyptian Cotton Breeding, were station visitors on September 29 and 30.

The maximum temperature for the two-week period ending October 19 was 106.5, minimum 51, and greatest daily range 48. No precipitation was recorded. All the days except one were clear.

The Colorado River deposited a record amount of silt for the months of August and September. During these two months a total of 72,380 acre-feet of silt was carried past Yuma. This amount is larger than that for the entire year of 1928 when the yearly deposit of silt was 61,708 acre-feet. The 29-year average amount of silt flowing past Yuma, however, is 103,600 acre-feet. There has been increased dredging in the Yuma Valley on account of the large amount of silt.

The weather has been almost ideal for cotton picking. The shortage of pickers has been remedied. So far this season 13,345 bales of cotton have been ginned in the Yuma Valley.

All the alfalfa on the rotations has been clipped and watered after lying dormant all summer. The alfalfa plants seem to be very slow in starting to grow again.

Most of the dates on the station have ripened and have been picked. Many of the later dates are of poor quality.

Arthur T. Bartel.

M I S C E L L A N E O U S

Technical Bulletin No. 144 entitled "Irrigated Crop Rotations in Southern Montana," by Stephen H. Hastings and Dan Hansen, was recently issued.

The Agricultural Experiment Station of the State College of Washington has issued Popular Bulletin No. 145 entitled "Units of Measurement and the Application of Irrigation Water." The author is Mr. C. C. Wright of the Irrigation Branch Experiment Station at Prosser.

Mr. S. H. Hastings, Senior Agronomist, is now in the Southwest on a field trip, having left Washington on October 6. His itinerary includes the field stations of this office located at San Antonio, Texas, and at Bard, California, and the Rubidoux Laboratory at Riverside, California.

Mr. A. C. Cooley, Senior Agriculturist in Charge of Demonstrations on Reclamation Projects, Extension Service, arrived in Washington on October 14 and has been making this office his headquarters during his stay in the city.

W E E K L Y R E P O R T S
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Huntley

Mr. Hansen reported as follows under date of October 28:

"The fall season has been very favorable. The harvesting is completed. With another week of good weather the fall plowing will be done. The beet harvest on the project is about 85 per cent completed.

"In the cooperative lamb-feeding test that was started at this station on October 22 there are ten lots of 30 lambs each. These are good range feeder lambs and average 60 pounds in weight. They were obtained from a local firm at 11 cents a pound and will be turned back to this firm at 12½ cents a pound at the end of the feeding period. The feed is furnished by the Montana State Station, and this station (Huntley) provides the pens, equipment, and labor.

"It is planned to carry this test a total of 120 days and to obtain weights and market appraisal at the end of the first 90 days as well as at the end of the feeding period. At the conclusion of the test a "Feeders Day" meeting will probably be held, at which the results of the test will be made available, the various lots of lambs inspected, and the results explained. There is already a good deal of local interest in this undertaking.

"An outline of this cooperative lamb-feeding test follows."

Lots and Rations

Lot I.- Full feed barley and alfalfa.
Lot II.- Full feed barley and cull beans (3 to 1) and alfalfa.
Lot III.- Full feed barley, alfalfa, and beet tops.
Lot IV.- Full feed barley, alfalfa, and corn silage.
Lot V.- Full feed barley, alfalfa, and pulp.
Lot VI.- Full feed barley, alfalfa, and pulp. Feed cottonseed cake up to ¼ pound per head daily.
Lot VII.- Full feed barley, alfalfa, and pulp. Feed cottonseed cake up to ¼ pound per head daily. Feed molasses up to 1/3 pound per head daily.
Lot VIII.- Full feed corn, alfalfa, and pulp. Feed molasses up to 1/3 pound per head daily. Feed cottonseed cake up to ¼ pound per head daily.
Lot IX.- Full feed alfalfa and pulp. Feed cottonseed cake up to ¼ pound per head daily. Feed molasses up to 1/3 pound per head daily.
Lot X.- Feed ½ amount of alfalfa fed to Lot I. Full feed bean straw and pulp. Feed cottonseed cake up to ¼ pound per head daily. Feed molasses up to 1/3 pound per head daily.

Huntley (cont'd)

Order of Feeding

Feed all lots a light feed of hay before breakfast. Immediately after breakfast start feeding grain. Feed Lots I, III, V, and VII their grain first, and Lots II, IV, VI, and VIII their grain last on the first day; and on the second day reverse the order, that is, on the second day feed Lots II, IV, VI, and VIII first. Leave the lambs with the grain for about 30 minutes; then let them back into their respective pens. Invert the troughs before the second bunch of lambs gets in, and always have grain in troughs before letting lambs into the grain pens. Start the lambs at about 3 pounds per lot per feed and increase as rapidly as good feeding permits. They will probably be eating 12 or 15 pounds per lot per feed in three or four weeks.

While Lots I, III, V, and VII are eating their grain, beet tops can be fed to Lot III. During this time the grain can be weighed out for the other lots (and corn silage can be weighed on the days Lots I, III, V, and VII are fed first).

While Lots II, IV, VI, and VIII are eating their grain, silage can be fed.

When all the lots that get grain have received their morning grain ration, feed Lots I and II a little more hay and feed the pulp to Lots V, VI, VII, VIII, IX, and X. In feeding pulp, put down the number of scoops fed each lot and the total weight of the load hauled. Always divide the pulp so that all of it is fed. Feed about 20 pounds per lot per feed to start and increase it as fast as they clean up most of it, leaving a little to gradually form a natural trough.

As soon as the pulp is fed, feed the molasses and cake on the pulp. Be careful to put the molasses in depressions in the pulp so none will be wasted. Start feeding the molasses at the rate of 2 pounds per lot per feed and increase up to 5 pounds per lot per feed in about ten days. Lots VII, VIII, IX, and X get molasses.

Feed the cottonseed cake on the pulp at the rate of 1 pound per lot per feed and increase up to 3.8 pounds per lot per feed in about two weeks, or as fast as they will take it.

Now feed hay to all lots.

Shortly after noon stir up the hay and see that all lots have some.

At about 3:30 p.m. start feeding grain again. Follow with all feeds in the same order as in the morning. Grain, tops, silage, pulp, cake, and molasses are fed again in the evening. Just before leaving give all lots a good feed of hay for the night.

Prosser

Report for week ending November 2.

The station crops are all harvested with the exception of about 15 acres of corn which is to be husked for grain. No feeding experiments are to be conducted here this winter, but all of the feed will be consumed by the dairy stock and sheep, of which there are about 50 and 100 head, respectively.

The potatoes, corn, and wheat on the irrigation plots at this station were harvested during September and October. The yields from these plots together with the cropping methods and irrigation treatments are given in the following tables.

Prosser (cont'd)

Irrigation Experiment With Potatoes, 1929

Plot No.	Hours run	Number of irrigations	Water applied, acre-inches		Yield of potatoes		
			Each irrigation	Total	Pounds per plot	Pounds per acre	Tons per acre
1	4	9	2.4	21.6	1,404	21,100	10.5
2	8	9	3.6	32.4	1,522	22,850	11.4
3	12	9	5.4	48.6	1,367	20,520	10.3
4	24	9	10.8	97.4	1,526	22,900	11.45
5	8	10	3.6	36.0	1,891	28,400	14.2
6	8	10	3.6	36.0	1,555	23,350	11.7
7	(4 (Alternate rows)	9)	1.2	10.8	1,249	19,440	9.7
8	8	9	1.8	16.2	1,445	21,700	10.8
9	12	9	2.7	26.3	1,562	23,450	11.7
10	24	9	5.4	48.6	1,546	23,200	11.6
1-a	4	9	2.4	21.6	1,515	22,750	11.4
2-a	8	9	3.6	32.4	1,466	22,000	11.0
3-a	12	9	5.4	48.6	1,710	26,000	13.0
4-a	24	9	10.8	97.4	1,495	22,500	11.2
5-a	8	10	3.6	36.0	1,460	22,000	11.0
6-a	8	10	3.6	36.0	1,547	23,450	11.7
7-a	(Alternate rows) (4	9)	1.2	10.8	1,474	22,100	11.1
8-a	8	--	1.8	16.2	1,552	23,300	11.6
9-a	12	9	2.7	26.3	1,496	22,500	11.2
10-a	24	9	5.4	48.6	1,471	22,200	11.1

Notes:

1. Ground plowed from alfalfa sod in fall, 1928.
2. Ground plowed again in latter part of May, 1929.
3. Irrigated before planting June 5 and 6, 8 acre-inches applied.
4. Potatoes planted June 11, 1929.
5. Date of emergence June 28.
6. Plots 5 and 5-a irrigated July 2.
7. Plots 6 and 6-a irrigated July 11.
8. Regular schedule of weekly irrigation, July 24.
9. All plots hilled July 28 except No. 2.
10. Last irrigation September 17.
11. Plots dug October 28 and 29.
12. Area of plots irrigated 0.10 acre.
13. Area of plots weighed 0.066 acre.

Prosser (cont'd)

Irrigation Experiment with Corn, 1929

Plot No.	Number of irrigations	Time between irrigations	Hours run	Water applied, acre-inches		Yield of corn fodder	
				Each irrigation	Total	Pounds per plot	Tons per acre
1	7	10 days	4	1.2	8.4	271	8.9
2	7	10 "	8	2.0	14.0	331	10.8
3	7	10 "	12	3.2	22.4	332	10.9
4	4	20 "	6	1.6	6.4	318	10.4
5	4	20 "	12	3.2	12.8	339	11.1
6	4	20 "	24	6.3	25.2	322	10.5
7	3	30 "	8	2.0	6.0	250	8.2
8	3	30 "	12	3.2	9.6	287	9.4
9	3	30 "	24	6.3	18.9	336	11.0
1-a	7	10 "	4	1.2	8.4	285	9.3
2-a	7	10 "	8	2.0	14.0	350	11.4
3-a	7	10 "	12	3.2	22.4	397	13.0
4-a	4	20 "	6	1.6	6.4	324	10.6

Notes:

1. Ground manured during winter, 15 tons per acre.
2. Irrigated before planting, May 2 and 3; 10.3 acre-inches per acre.
3. Ground plowed May 4.
4. Corn planted May 7.
5. First irrigation, all plots, July 2.
6. Corn fodder cut September 25.

Irrigation Experiment With Wheat, 1929

Plot No.	Number of irrigations	Hours run	Dates irrigated	Water applied, acre-inches				Yield, bushels per acre
				Each irrigation	Total	Estimated per cent waste	Net water	
1	2	8	4/27, 5/27	3.1	6.2	5	5.9	25.5
2	3	12	4/22, 5/17, 6/17	4.5	13.5	15	11.5	33.2
3	3	24	4/22, 5/17, 6/17	9.0	27.0	30	19.0	28.8
4	4	24	4/17, 5/7, 5/27, 6/17	9.0	36.0	30	25.0	29.1
5	5	24	4/17, 5/7, 5/22, 6/6, 6/21	9.0	45.0	30	31.5	32.0

Notes:

1. Ground plowed in fall of 1928.
2. Ground disked before planting.
3. Wheat planted March 11.
4. Land ditched immediately after planting.
5. Wheat emerged March 25.

Prosser (cont'd)

The combination grade of potatoes sold for $40 per ton, and the No. 2 grade $25 per ton. The plots averaged about 75 per cent combination grade. There was no noticeable difference in the quality of the potatoes from the various plots.

C. C. Wright.

San Antonio

The following meteorological data were recorded during the week ending October 26: Maximum temperature 85, mean maximum 72.3; minimum 47, mean minimum 51.7; mean 62; greatest daily range 34 degrees; precipitation 1 inch. Four days were clear and three were cloudy.

The outstanding feature of the weather of the past week was the low mean temperature. The mean temperature for October for the last 22 years is 69.9, the mean of the preceding week was 72.6, while the mean of the past week dropped to 62.0 degrees. The first four days of the week were clear and fairly warm. A "norther" blew in the evening of the 23d, and the maximum temperature during the last three days of the week was 68. The precipitation recorded came in the form of a slow drizzle with no run-off from fields.

Fields C-4 and E-3 were plowed with the tractor. With no chopping or previous treatment, cotton plants on C-4, ranging from 3 to 5 feet tall, were plowed under with little difficulty. The cotton on rotation plots was mowed in preparation for plowing with the disk plow.

The second crop of sorghum in 8-inch drills was hauled to the stack yard. The quality of the hay was poor due to drought.

The work of removing the large bamboo clump near the tennis court was started.

The mess hall was repapered, woodwork painted, and new linoleum was laid during the week.

The moisture samples of corn in the rotations and the corn variety test have been reweighed, shelled, and the yields computed. Yields of corn in the rotations were very good and the quality of corn was excellent.

Yields of corn, variety test, 1929

Variety	Series I	Series II	Average	Test weight
	Bushels	Bushels	Bushels	Lbs.per bu.
Laguna	26.0	31.1	28.6	56.0
Mississippi Laguna	30.1	27.6	28.9	57.0
Evin's Yellow Dent	27.0	33.0	30.0	53.5
Horton	23.1	21.7	22.4	51.0
Thomas	28.1	34.0	31.1	57.5
Reese Drought Resister	15.3	18.9	17.1	52.0
Hasting's Prolific	23.4	35.9	29.7	59.0
Delta Prolific	19.7	31.0	25.4	55.0
Row Spacing Test				
3.5 foot rows	---	----	30.3	51.0
4.1 " "	----	----	29.8	50.0
5.0 " "	---	----	24.4	----

San Antonio (cont'd)

Yields of Corn, Rotation Experiments, 1929

Rotation	Yield	Test weight	Rotation and treatment
		Lbs.	
A4-B	38.3	57.0	Corn, plowed July; fallow.
A4-D	48.1	57.0	Corn, plowed July; cotton, plowed Nov.
A6-A	36.7	54.5	Corn, plowed July; oats, hay, plowed May.
A6-B	33.8	54.0	Corn, plowed July; oats, hay, plowed Nov.
A6-C	45.6	57.0	Corn, plowed July; oats, hay, subsoiled May.
A6-D	41.7	55.5	Corn, plowed July; milo, plowed fall.
A6-E	45.6	54.0	Corn, plowed July; oats, grain, manure, subsoiled June.
A6-F	45.9	55.5	Corn, plowed July; Sudan grass, manure, plowed Nov.
B5-1	32.7	53.5	Corn, continuously, plowed July.
B5-2	28.6	53.0	Corn, continuously, manure, plowed July.
B5-C	33.8	53.5	Corn, plowed July; sorghum 4.1' rows, plowed Nov.
B5-D	35.9	53.5	Corn, plowed July; sorghum 8" drills, plowed Nov.
B6-A	42.6	57.0	Corn, plowed July; cotton, plowed Nov.
B6-B	46.0	56.5	Corn, subsoiled July; cotton, subsoiled Nov.
B6-C	42.9	55.0	Corn, manure, plowed July; cotton, plowed Nov.
B6-D	37.3	55.0	Corn, manure, field peas, plowed spring; cotton, plowed Nov.
B6-E	44.3	54.5	Corn, manure, field peas, plowed spring; cotton, subsoiled Nov.
B6-F	43.8	56.0	Corn, disked July; cotton, plowed Nov.
B6-G	44.9	55.0	Corn, plowed Feb.; cotton, plowed Feb.
B6-H	42.1	54.0	Corn, subsoiled Feb.; cotton, subsoiled Feb.
B6-I	46.2	53.5	Corn, rye, plowed Feb.; cotton, plowed Feb.
Average	40.8		

Report for the week ending November 2 and weather summary for October:

Meteorological data were recorded as follows:

	Week ending November 2	Month of October	22-year average
Temperature-			
Maximum	86.0	98.0	----
Mean maximum	78.0	83.0	----
Minimum	48.0	47.0	----
Mean minimum	55.0	58.8	----
Mean	66.5	70.9	69.9
Greatest daily range	31.0	37.0	----
Precipitation (inches)	.10	1.87	2.82
Mean wind movement (miles per hour)	---	2.1	2.8
Evaporation (inches)	---	4.33	5.13
Aspect of the sky (days)-			
Clear	6	23	----
Partly cloudy	0	4	----
Cloudy	1	4	----

San Antonio (cont'd)

There were few unusual features of the weather during October. The number of clear days was unusually large. The mean temperature for the month was slightly above normal, while rainfall, evaporation, and wind movement were below the average. Low rainfall combined with the long summer drought made fall pasture conditions poor, and small grains have either not emerged or have made little growth.

The new tractor disk-harrow arrived during the week and was used in preparing the seedbed for wheat in the pasture. The pasture near the corral was plowed, disked, and harrowed in preparation for seeding to wheat. Cotton stalks were burned, and part of the plots on C-5 were plowed. Numerous repair jobs, such as making a new greenhouse center bench and refinishing the dining room furniture, occupied all of the time not used for field work.

I. M. Atkins.

Yuma

The maximum temperature for the week ending November 2 was 84, minimum 35, and greatest daily range 43. No precipitation was recorded.

The meteorological data for the month of October are as follows: Mean maximum 92.9, mean minimum 54.2, maximum 106.5, minimum 35; greatest daily range 48; precipitation, none. Twenty-six days of the month were clear and five were partly cloudy. The 20-year average precipitation for October is 0.289 inch.

The cotton in the Yuma Valley is being picked rapidly; 2,012 bales were ginned during the past week, making a total of 17,400 bales for the season.

The Second Annual Pecan Growers' Association meeting was held November 1. The program consisted of a tour throughout Yuma Valley, visiting various pecan orchards and nurseries. A banquet was held in the evening. Approximately 200 interested people were in attendance.

All the corn in the rotations has been husked, and the larger part of the milo has been headed. A few of the milo plots were threshed. Four alfalfa plots in the rotations were plowed and are to be planted to barley soon.

Station visitors included Dr. F. M. Eaton, Mr. S. H. Hastings, and Mr. Roy W. Nixon.

Arthur T. Bartel.

W E E K L Y R E P O R T S
Of The Office Of
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Vol. XXXI November 9, 16, and 23, 1929 No. 21

Belle Fourche

Mr. Beyer Aune reported as follows under date of November 12:

"The weather conditions during October and so far in November have been at their worst to get any field work done. This applies particularly to harvesting beets and plowing. The more than 4 inches of rain during the last week in September and the first week in October has since been supplemented at intervals with two or three snows, so that the harvesting of beets is not yet completed. The last few days that work was possible some rows of beets from each plot in field A were harvested, so there is at least a comparative yield from each rotation. It is hoped, however, that the rest of the beets can be harvested before the final freeze up.

"The lamb-feeding experiment was started on October 17. There are 14 lots with 39 lambs to the lot. They are being fed rations in the same proportion as last year. The continuing wet weather has been very hard on all sheep and particularly so on feeder lambs, and there may not be much gain during the first 70 days.

"There was another snowstorm yesterday, which will delay farm work for a time; but as it looks brighter today there is still hope of getting the beets harvested."

Under date of November 21 Mr. Aune reported as follows:

"During the last two days there was quite a freeze. Some beets are still in the ground, and we may not be able to get them out. The other work is progressing fairly well.

"The feeder lambs were weighed for the first 30 days, and the average gain for all lots was .28 pound per lamb per day. Considering the unfavorable weather that has prevailed all fall, the gains were better than were expected."

Huntley

The weather for the most part being favorable, the harvesting of all crops at the station was completed during the four-week period ending October 26. Fall plowing of the rotation plots has been practically finished and plowing of miscellaneous fields is nearing completion. The maximum temperature for this period was 80, minimum 16, and precipitation .40 inch.

Yields of potatoes and sugar beets in the irrigated rotation experiments are given in the following tables.

Huntley (cont'd)

Yields of potatoes in the irrigated rotations in 1929

Rotation No.	Plot No.	Stand, plants per acre	Yield		Per cent marketable
			Pounds per plot	Bushels per acre	
4	K- IV- 21	8,832	2,120	141.3	83
20	- V- 6	8,512	2,330	155.3	89
21	- 14	8,832	5,300	353.3	89
24	- 10	8,064	2,310	154.0	86
25	- IV- 5	8,960	4,220	281.3	87
26	- V- 12	8,192	2,390	159.3	86
27	- 19	7,680	1,870	124.7	82
30	- IV- 16	9,088	2,350	156.6	80
31	- III- 14	8,576	2,300	153.3	86
40	- IV- 2	8,000	3,930	262.0	92
44	- 12	7,936	2,890	192.7	88
60	- III- 11	9,216	4,020	268.0	93
61	- 5	8,192	5,090	339.3	92
4-a	L- IV- 9	9,048	3,330	222.0	87
34	- 2	8,840	2,590	172.7	89
35	- 6	9,360	5,230	348.7	92
64	- 18	8,736	4,420	294.7	95
Average		8,592	3,335	222.3	88

The maximum yield of potatoes was obtained from rotation 21, the yield per acre being 353.3 bushels. The minimum yield in 1929—124.7 bushels to the acre—was obtained from rotation 27, while the average from all the plots was at the rate of 222.3 bushels to the acre.

Huntley (cont'd)

Yields of sugar beets in the irrigated rotation experiments, 1929

Rotation No.	Plot No.	Yield: Pounds per plot	Yield: Tons per acre	Stand, plants per acre	Sugar content, per cent	Tops, per cent of total wt.
2-a	K- V- 22	4,085	8.17	23,968	Sample lost	26
10	- II- 7	9,440	18.88	23,072	18.8	25
18	- V- 3	3,359	6.72	22,176	18.8	22
20	- 5	4,965	9.93	23,744	17.9	24
21	- 13	9,376	18.75	26,208	18.8	22
22	- 7	2,520	5.04	24,864	16.8	29
23	- 15	9,855	19.71	22,400	17.5	21
30	- IV- 15	3,143	6.29	24,864	17.2	26
31	- III- 13	7,287	14.57	25,312	19.8	28
32	- IV- 18	3,579	7.16	25,648	17.1	32
40	- 3	4,140	8.28	25,088	Lost	32
42	- 9	2,002	4.00	21,728	15.6	37
60	- III- 7	3,986	7.97	22,624	17.2	37
61	- 1	8,576	17.15	25,312	19.2	26
67	- II- 1	8,809	17.62	21,616	18.0	30
2-aa	L- IV- 5	6,881	13.76	24,000	17.9	33
34	- 4	2,744	5.49	19,392	18.6	27
35	- 8	8,613	17.23	23,616	18.4	25
46	- 12	3,017	6.03	17,280	18.2	36
64	- 17	5,211	10.42	19,680	17.1	34
37	L- I- 3	7,998	16.00	20,256	16.0	33
47	- 11	8,478	16.96	23,040	14.8	30
49	- 7	10,516	21.03	24,960	17.2	27
49	- 8	10,378	20.76	21,120	16.8	31
Average		6,207	12.41	22,999	17.6	29

The maximum yield of sugar beets—21.03 tons to the acre—was obtained from rotation 49; while the minimum yield in 1929—4 tons to the acre—was obtained from rotation 42. The average yield from all of the rotations was at the rate of 12.41 tons to the acre.

Sugar beets in the fertilizer experiment, conducted in cooperation with the Office of Soil Fertility Investigations of the Bureau of Chemistry and Soils, were harvested during this period under the supervision of Mr. Lewis A. Hurst of that office. Yields and other data relating to this test are given in the following table.

Huntley (cont'd)

Yields of sugar beets in the fertilizer experiment, Huntley Field Station, 1929

Plot Number	Fertilizer formula NH_3	P_2O_5	K_2O	Number of rows	Stand, plants per plot	Yield: Pounds per plot	Yield: Tons per acre	Average sugar content, Per cent	Per cent tare, avg. of 3 samples
1-A	0	20	0	4	880	1,088	16.32	17.5	7
	(16% superphosphate)								
1-B	0	20	0	4	844	1,018	15.27	18.5	8
	(A.C.M. 45% treb.sup.ph.)								
Check	0	0	0	8	1,704	1,539	11.54	18.5	14
2	0	16	4	4	936	1,141	17.12	18.7	8
3	4	16	0	4	964	1,150	17.25	17.9	8
Check	0	0	0	8	1,728	1,575	11.81	18.6	12
4	0	12	8	4	868	1,108	16.62	17.9	7
5	4	12	4	4	972	1,076	16.14	17.8	8
6	8	12	0	4	844	1,125	16.88	18.1	7
Check	0	0	0	8	1,680	1,558	11.69	17.5	11
7	0	8	12	4	908	1,086	16.29	18.2	8
8	4	8	8	4	896	1,092	16.38	18.7	9
9	8	8	4	4	964	1,172	17.58	18.0	7
Check	0	0	0	8	1,852	1,798	13.49	17.8	11
10	12	8	0	4	908	1,192	17.88	18.4	9
11	0	4	16	4	944	1,184	17.76	17.8	6
12	4	4	12	4	952	1,116	16.74	17.0	7
Check	0	0	0	8	1,840	1,684	12.63	18.1	9
13	8	4	8	4	944	1,065	15.98	17.6	9
14	12	4	4	4	912	1,030	15.45	18.1	8
15	16	4	0	4	868	1,053	15.80	17.6	6
Check	0	0	0	8	1,808	1,929	14.47	17.9	9
16	0	0	20	4	916	995	14.93	17.9	7
17	4	0	16	4	900	996	14.94	17.9	6
18	8	0	12	4	920	996	14.94	18.3	6
Check	0	0	0	8	1,820	1,980	14.85	18.4	10
19	12	0	8	4	848	1,030	15.45	17.9	8
20	16	0	4	4	824	977	14.66	18.0	7
21	20	0	0	4	840	930	13.95	18.3	7
Check	0	0	0	8	1,760	2,151	16.13	18.2	10
22	Ammo.sulph. 200# per acre			4	652	772	11.58	17.4	7
23	" " 400# " "			4	504	589	8.84	17.6	8
24	Superphos. 100# " "			4	856	1,344	20.16	18.1	6
25	" " 300# " "			4	880	1,194	17.91	18.3	6
Check	- - - - - - - - - - - - - -			8	1,648	1,748	13.11	17.6	7

Notes:

Fertilized plots, 4 rows each, plots 1/30th acre in area.
Check " , 8 " " , " 1/15th " " " .
Preceding crops, 1926- oats (sweet clover); 1927- sweet clover (cow pasture); 1928- corn.
Plowed Oct. 1928; beets seeded May 1, 1929; fertilizer applied at time of seeding.
Rate of application of fertilizer in triangle experiment, 200 lbs.per acre.
Plots 22 and 23 reseeded June 8; first seeding stand failure due to action of fertilizer on seed.
Date of harvest Oct. 5-7; date of thinning June 18; dates of irrigation May 10, July 7, 19, 27, Aug. 10, 26, and Sept. 9.

Dan Hansen.

Prosser

Report for the three-week period ending November 23.

Through the efforts of a local turkey growers' association, which was organized at Prosser the first of this month, the Washington Cooperative Egg and Poultry Association, with headquarters at Seattle, has been buying turkeys in the Yakima Valley during the last two weeks. It has been able to pay from one to five cents a pound more than was being offered by other buyers. About two carloads have been shipped from the valley by this association at 31 and 33 cents per pound to the grower. It is estimated that only about 25 per cent of the crop will be sold for the Thanksgiving market.

The dressed turkeys are collected at various valley points in trucks. The "Egg Association" furnishes the boxes and the packing crew. The growers bring the turkeys to a designated point, either in town or at one of the farms, where they are graded, weighed, and packed. A crew of four men—three packers and one man to weigh and grade--packed and loaded about 1000 turkeys in one half day. The growers get a receipt and receive check paying the full amount the following week.

It is understood that the turkey business will be kept separate and at the end of the year a dividend will be paid if the sales bring anything over handling costs.

C. C. Wright.

San Antonio

During the week ending November 9 the following meteorological data were recorded: Maximum temperature 80, mean maximum 70.1; minimum 38, mean minimum 51.7; mean 60.9; greatest daily range 29 degrees; precipitation 1.59 inches. Four days were clear and three were partly cloudy.

Clear, cool weather prevailed the first of the week, and the temperature dropped to 38 on the 4th. It did not frost, however. Cloudy weather with a drizzling rain prevailed the last three days. Practically all the rainfall came slowly and very little run-off occurred. This will be of great benefit to fall pastures.

The remainder of the cotton plots in field C-5 were plowed, and fall plowing in the rotations was started.

Seedbeds for the field peas for green manure in the rotations were prepared with the tractor disk. All except two plots were planted. The remainder will be planted as soon as more seed is obtained. Wheat was seeded in the corral pasture. Fields B-4, part of D-3 C-3, and the pistache orchard on D-4 were disked with the tractor disk.

During the rainy weather the last of the week the labor was occupied shelling corn.

Mr. H. V. Jordan, Associate Soil Technologist, and Mr. Jenkins, both of the Bureau of Chemistry and Soils, Austin, Texas, were at the station on November 7 mapping rootrot areas in their experiments.

The following meteorological data were recorded during the week ending November 16: Maximum temperature 82, mean maximum 65; minimum 30, mean minimum 41.9; mean 53.4; greatest daily range 30 degrees; precipitation .12 inch. Six days were clear and one was cloudy.

The first frost of the season occurred during the week, the temperatures falling to 31 on the night of the 14th and to 30 on the night

San Antonio (cont'd)

of the 15th. This was four days earlier than the average date of the first frost. Tender vegetation, such as beans and tomatoes, was injured; and a group of Papaya plants in the nursery was also injured but not killed.

Field work was impossible the first of the week on account of rains the previous week. The time was spent shelling corn and making miscellaneous repairs. The plowing of rotation plots was continued the last three days of the week.

Cowpeas for green manure, following oats, in rotations A5-D and A5-E were plowed under. The tonnage was much smaller than last year. The two remaining plots of field peas for green manure were planted.

Orchards A-1 and B-3 were cultivated with the orchard cultivator to destroy winter weeds. The bamboo clump near the tennis court has been cut off and the work of grubbing out the roots was started.

I. M. Atkins.

Yuma

The maximum temperature for the week ending November 9 was 89, minimum 37, and greatest daily range 48.5. No precipitation was recorded.

The picking of cotton in the rotations has started. All of the milo has been headed. Vetch was planted in two of the cotton rotations and sour clover in another. The seed was broadcasted through the cotton plants before the cotton was picked. The plots were then irrigated to insure immediate germination. The vetch and sour clover will be used as a green manure crop early next spring.

Station work included the heading of milo, husking corn, picking cotton, and plowing and leveling some alfalfa land.

The maximum temperature for the week ending November 16 was 81 and greatest daily range 53. No precipitation was recorded. All the days in the week were clear.

The first frost this season occurred on November 14 when the mercury went down to 27 degrees. A temperature this low is rather exceptional for the first frost in the fall.

The shipping of grapefruit from the Yuma Mesa started last week. Two carloads were shipped, one of them containing 400 boxes. It is estimated that the total crop of grapefruit for this year will be about 100,000 boxes.

The total cotton that has been ginned to date in the Yuma Valley amounts to 21,031 bales. This is 543 bales more than was ginned in 1928 by this time and is also higher than any other year for the same period.

Station work for the week included the picking of cotton in the rotations, ginning cotton, cutting milo stalks, and spring-toothing alfalfa.

Arthur T. Bartel.

M I S C E L L A N E O U S

Washington, D. C.,
November 19, 1929.

Mr. Ray Priest,
Bureau of Reclamation,
Yuma, Arizona.

Dear Mr. Priest:

Mr. Wilcox has reported to me the results of the analyses of the water samples you have taken from the deep wells in the Yuma Valley. It is my understanding that these wells tap a layer of water-bearing gravel that lies approximately at sea level or about 100 feet below the surface of the Yuma Valley and in which the water is under such pressure as to force it up nearly to the surface. In considering the general problem of the underground waters of the Yuma Valley, with particular reference to the possibility of drainage by means of pumping from deep wells, it has seemed desirable to determine, if possible, the source of the water that occurs in this deep gravel layer.

Some years ago I obtained a few samples of water from some of these deep wells and found that the character of the salts they contained was essentially different from that of the water of the Colorado River and more nearly like that of the Gila River. This lead me to think that possibly the so-called "Gila underflow" was carried in the gravels that are tapped by the deep wells located not only in the Yuma Valley but on the Yuma mesa. The further inference was that possibly the water of the Colorado might not be the chief contributor to the underground water of the Yuma Valley.

I had to recognize the fact that there appears to be hydrostatic connection between the Colorado River and the underground water of the Yuma Valley because of the fact that the water level in valley wells rises and falls with changes of the river level. But I believed that this hydrostatic relationship did not necessarily imply a substantial movement of water from the river into the valley subsoil. Nor do I believe that there is a very pronounced movement down-stream of the water in these deep gravels. In using the expression "Gila underflow" I do not mean to imply that there is very much "flow" in that body of water.

It has been my belief that it would be quite practicable to put down a series of wells in the Yuma Valley to tap the gravel bed that underlies the valley and by pumping from these wells to lower the water-table in the valley subsoil to a point where it would no longer menace the productivity of the soil. This belief is, of course, based on the assumption that the rate of inflow into this body of subsoil water, either from the Colorado or from the Gila, would not be so rapid as to exceed the volume of water that it would be practicable to remove by pumping.

The purpose of our survey this season of the waters tapped by the shallow wells of the valley was to determine whether or not there is a measurable inflow of Colorado water in the upper horizon of the subsoil water of the valley. The evidence now available after six months' observation is that this inflow must be very slow. I am now of the opinion that if the level of the subsoil water of the valley were to be lowered by as much as 5 feet, the inflow from the river would still be very slow and its total volume small.

Miscellaneous (cont'd)

As collateral evidence bearing on this point we have the results obtained by the city of Los Angeles in their filtration experiment at Blythe. My memory of that experiment is that the city opened a ditch about 1000 feet back from the river, cutting it 12 feet below the static level of the underground water. This ditch was two miles long. After it had been opened and the water in it had risen to the static level, a pump throwing 7 cubic feet per second was started. This emptied the ditch in about 18 hours. In other words, the rate of inflow from the river into this ditch through 1000 feet of subsoil was so slow as to yield less than 3.5 c.f.s. per mile of river front, and with a 12-foot drawdown in the ditch. If conditions at Blythe and in the Yuma Valley are comparable, it is apparent that a lowering of the level of the subsoil water by 5 feet would not result in a very serious inflow of water from the river.

We have now to consider the question as to what might be expected to happen if a number of large wells were sunk to the gravel bed below the Yuma Valley and pumps installed with a view to lowering the level of the water in the valley subsoil. In the first place, is it fair to assume that if a large volume of water, say 4 c.f.s., were pumped from one of these wells, that withdrawal would affect the level of the underground water in the vicinity of the well? I think it would. All the evidence we have from similar situations in other sections of the Southwest tends to support that view. But it might be assumed that if this gravel bed from which the pump is to draw were being replenished freely from the Colorado River, then continued pumping would result merely in diverting water from the river by this underground connection. As bearing on this possibility I have to submit the evidence obtained from our analyses of the samples you collected recently from the 30 deep wells in the valley and other samples from that vicinity.

I might point out, at first, that if there existed a very direct connection and free movement of water from the channel of the Colorado into the gravel bed below the Yuma Valley, we would expect to find that the salt content and the character of the salts in the water of this gravel bed would be approximately the same as we find in the water of the river. That is exactly what we do find, for example, along the Gila at Sacaton and in the Salt River Valley.

I might add also that the character of the salt of the water of the Colorado River at Yuma is very different from that of the Gila with respect to the ratio of chlorides to sulphates. In the Colorado water the ratio of chlorides to sulphates is approximately as 0.4 to 1, while in the Gila water it is seldom less than 3 to 1 and sometimes as much as 5 to 1 or even higher.

In Table 86/29, which accompanies this letter, I have summarized the results of the analyses of water samples that represent the following:

1. The underground water of the lower Gila as sampled in the vicinity of Welton, Arizona.
2. The underground water of the Yuma mesa.
3. The underground water of the Colorado River Valley as sampled by deep wells in the vicinity of Bard, California.

Miscellaneous (cont'd)

4. The underground water from the deep gravel bed underlying the Yuma Valley as recently sampled by you.
5. The Colorado River as sampled each week for the past year.
6. The drainage water from the Yuma Valley as sampled at the boundary pump.

These results show that in the well waters from the Welton area the chloride-sulphate ratio is 4.73 to 1. In the area of the Yuma mesa it is 5.95 to 1, indicating rather definitely that the water under the Yuma mesa is derived from the Gila rather than from the Colorado. The samples from the deep wells around Bard have a ratio of 1.17 to 1. This is higher than that found in the Colorado River water but much lower than in Gila water. The deep wells of the Yuma Valley show a mean ratio of 2.45 to 1, while the drainage from the Yuma Valley shows a ratio of 2 to 1.

The inference that I draw from these results is that the water found in the deep gravel under the Yuma Valley is chiefly derived from the Gila drainage. It is doubtless somewhat diluted by percolating water from the channel of the Colorado, but it appears to be much more like Gila than Colorado water. It seems to me that there is ground for the view that there is some Gila water even in the area tapped by the deep wells near Bard.

I want to mention also the Yuma drainage water. This has a total salt content higher than the annual mean of the Colorado, which is not surprising since there would be some concentration from evaporation losses; but the high ratio of chlorides to sulphates is not to be accounted for by evaporation. It seems to me that this high chloride-sulphate ratio indicates that Gila water is percolating upward from the deep gravel bed below the Yuma Valley and contributing somewhat to the valley drainage water. I do not mean to claim that this upward percolation is very rapid. It may have been going on very slowly for a long time and have resulted in depositing salt in the valley soil that is now being carried out in the drainage water. I assume that it is due to the hydrostatic head that exists in the deep gravel aquifer supplied from the Gila Valley.

I want to call your attention particularly to the variations in conductance ($K \times 10^5$) that are shown by the wells both of the Bard Valley and the Yuma Valley as shown in Table 85/29. It is not surprising that there should be variation in this conductance, which is a measure of the total salt content, because it is to be expected that in some places this water would be in contact with underground deposits of salty soil. It is to be expected that in general the salt content of this underground water would be equivalent to the mean salt content of the stream from which it is derived with variations upward from that as a base, the extent of the upward variations being determined by the salt content of the soil encountered in the aquifer. But I do not know how to account for those cases where the salt content is much below the mean salt content of either river. For example, the mean conductance of the Colorado as shown in Table 86/29 is 126×10^5, while the mean conductance of the Gila underflow is much higher; yet we find some wells both in the Bard Valley and in the Yuma Valley in which the water has a conductance of less than 100×10^5. Such a well as 9 S - 8 W, Lab. No. 2002, is really rather remarkable. It shows a very low salt content for that area and yet it has nearly the typical chloride-sulphate ratio.

Miscellaneous (cont'd)

Its sulphate content of r 1.43 is as low as occurred in the Colorado River at any time during the past year, and is very much less than the mean sulphate content of that water. I find myself rather perplexed as to the sources of the water that we have found in such of these deep wells as 2 S - 2-1/8 W, 9 S - 8 W, and 11 S - 9-3/8 W, and also in the shallow well, 7 S - 9 W, mentioned in my letter of November 1.

Very truly yours,

C. S. Scofield
Principal Agriculturist in Charge

Table 86/29.- The quality of the underground water of the lower Gila Valley compared with that of the Bard and Yuma Valleys. The means of analyses reported in Table 85/29.

Location	Number of samples	$K \times 10^5$ @ 25°C.	Reacting values					
			CO_3 + HCO_3	Cl	SO_4	Ca	Mg	AB
Welton area	16	393.5	4.28	27.76	6.71	7.47	4.73	26.55
Yuma mesa	7	295.3	3.53	22.09	3.71	6.58	5.44	17.31
Bard Valley	10	141.0	4.54	5.39	4.62	7.80	1.94	4.81
Yuma Valley	30	194.0	4.75	11.00	4.49	6.73	3.78	9.73
Colorado River	50	126.0	2.96	3.14	7.64	4.20	2.82	6.25
Yuma drain	12	228.0	5.04	12.21	6.11	6.87	3.83	12.66

The chloride : sulphate ratios are as follows:-

Welton area	4.73 : 1.0
Yuma mesa	5.95 : 1.0
Bard Valley	1.17 : 1.0
Yuma Valley	2.45 : 1.0
Colorado River	.41 : 1.0
Yuma drain	2.00 : 1.0

Miscellaneous (cont'd)

Table 85/29.- The quality of the underground water of the lower Gila from the Welton area to the lower Yuma Valley. Samples analyzed at the Limoneira Laboratory, 1929.

Lab. No.	Location			K X 10^5 @ 25°C.	Reacting values					
					CO_3+ HCO_3	Cl	SO_4	Ca	Mg	AB
	S	T	R							
	Welton:									
983	35	8	18	251	3.15	17.00	3.91	5.00	3.04	16.02
984	35	8	18	255	3.50	17.10	3.24	4.97	3.21	15.66
985	1	9	18	321	.80	19.65	9.53	5.52	2.71	21.75
986	3	8	17	277	1.85	16.40	7.54	4.67	.49	20.63
987	Brother Noah			601	1.95	47.25	7.15	4.60	2.11	49.04
988	28	8	16	250	1.20	14.00	7.47	1.47	0.0	21.20
1552	9	8	17	401	7.35	28.50	4.50	7.87	6.41	26.07
1553	10	8	17	317	6.50	21.60	3.29	7.14	5.13	19.12
1554	36	7	17	190	3.00	11.40	3.42	.73	.19	16.18
1555	5	9	19	573	5.00	43.15	9.05	9.53	7.06	40.61
1556	1	8	17	471	7.00	35.30	5.08	11.16	6.90	29.32
1557	26	7	16	279	4.60	18.45	4.59	5.73	4.70	17.21
1558	16	8	17	494	3.80	34.00	11.26	4.53	3.42	41.11
1559	16	8	17	697	6.65	51.40	14.12	10.24	10.47	51.46
1560	16	8	17	403	5.50	30.20	5.75	10.33	8.02	22.10
1561	34	7	16	517	6.60	38.90	7.46	26.00	11.86	15.10
Means				393.5	4.28	27.76	6.71	7.47	4.73	26.55
	Yuma mesa:									
1628	9	9	22	140	2.50	9.70	.84	1.17	1.92	9.95
1629	36	9	23	201	3.80	12.80	2.93	4.26	3.21	12.06
1630	8	10	23	212	3.20	14.35	2.62	4.90	2.78	12.49
1631	32	9	23	766	4.00	64.00	10.82	17.62	12.82	48.38
1632	5	10	23	202	3.10	14.10	2.32	4.59	3.31	11.62
1633	4	9	23	351	3.85	26.70	4.38	9.28	10.43	15.22
1634	10	9	23	195	4.25	13.00	2.10	4.23	3.63	11.49
Means				295.3	3.53	22.09	3.71	6.58	5.44	17.31
	Bard Valley:									
1083	Bard school			158	5.60	5.95	5.33	8.35	3.53	5.00
1084	Miller			123	3.80	2.90	5.10	5.42	3.10	3.28
1085	Expt. Farm			181	6.80	6.45	6.31	15.05	0.0	4.51
1086	Bard, Hall			84	3.70	2.85	1.81	3.57	1.47	3.32
1087	Expt. Farm			181	6.70	6.45	6.33	14.95	0.0	4.53
1088	Baskioch			143	3.00	6.25	4.74	6.65	1.31	6.03
1089	Cacich			98	3.55	3.00	3.89	4.35	2.31	3.78
1090	Ross			199	5.15	9.10	6.38	9.32	2.99	8.32
1091	Nordahl			81	3.20	2.95	2.01	3.22	1.35	3.59
1092	Mehring			161	3.95	8.00	4.31	7.12	3.31	5.83
Means				141	4.54	5.39	4.62	7.80	1.94	4.81

Table 85,29 (cont'd)

Lab. No.	Location	$K \times 10^5$ @ 25°C.	Reacting values $CO_3 + HCO_3$	Cl	SO_4	Ca	Mg	AB
	Yuma Valley:							
1918	0 S - 2 W	157	5.70	7.80	4.15	4.60	4.97	8.08
1919	½ S - 1/8 W	121	3.80	5.90	1.87	5.10	2.53	3.94
1920	5/8 S- 1-7/8 W	216	4.10	15.00	3.40	8.00	6.57	7.93
1921	1 S - 2-1/8 W	215	5.10	12.60	5.59	6.28	5.29	11.72
1922	1 S - 2-7/8 W	226	4.25	14.70	5.44	9.45	5.77	9.17
1923	1 S - 4-1/8 W	164	4.25	10.20	3.09	7.20	3.85	6.49
1924	1 S - 5-3/8 W	210	3.95	11.90	5.97	9.82	5.45	6.55
1925	1 S - 5-5/8 W	199	4.25	12.30	4.31	8.18	5.45	7.23
1926	2 S - 2-1/8 W	92	4.55	3.60	1.66	2.02	.99	6.80
1927	2½ S - 4½ W	326	5.45	22.70	7.89	9.15	7.06	19.83
1928	3-1/8 S- 5 W	258	6.35	19.60	4.92	7.65	8.18	15.04
1929	4 S - 7½ W	123	3.85	4.20	5.01	5.60	3.53	3.93
1930	3-3/4 S- 5½ W	166	4.45	10.00	4.79	5.62	4.49	9.13
1931	4 S - 3-3/8 W	247	4.25	11.40	9.33	6.50	5.13	13.35
1932	3½ S - 2 W	283	4.65	10.60	4.00	8.70	6.09	5.86
1996	5-3/8 S- 2 W	470	5.60	34.30	8.61	12.50	5.13	30.88
1997	5½ S - 6 W	276	6.20	17.10	6.71	9.90	4.17	15.94
1998	7 S - 4-3/8 W	223	3.90	14.40	4.22	9.40	1.92	11.20
1999	8½ S - 6½ W	120	4.25	6.40	3.43	4.20	1.55	8.33
2000	8½ S - 4 W	442	7.15	26.50	14.19	15.00	6.10	26.74
2001	9½ S - 5½ W	210	4.40	12.30	5.07	8.60	2.41	10.76
2002	9 S - 8 W	83	4.50	2.90	1.43	3.60	1.00	4.33
2003	10 S - 6½ W	115	4.40	3.50	2.18	4.17	1.60	6.31
2004	10½ S - 3-3/4W	179	3.90	10.60	3.26	5.30	3.05	9.41
2005	11 S - 7 W	104	4.50	4.40	2.04	4.00	1.60	5.34
2006	11 S - 9-3/8W	95	4.85	3.40	1.61	3.90	1.71	4.25
2007	11-5/8S- 5½ W	137	5.05	6.30	2.87	4.80	2.16	7.26
2008	13½S - 8-3/8W	125	4.85	5.45	2.35	3.80	2.37	6.48
2009	13 S - 10 W	99	4.20	3.90	1.82	3.50	1.41	5.01
2010	14-3/4S- 10 W	127	5.70	4.30	3.44	5.50	1.84	6.10
	Means	194	4.75	11.00	4.49	6.73	3.78	9.73
	Yuma Valley drain:							
895		242	5.20	13.30	6.36	7.20	4.72	12.94
953		238	5.10	12.90	6.39	7.07	3.21	14.61
1016		228	4.95	12.00	6.00	6.85	3.37	12.73
1036		241	5.00	13.40	6.65	7.37	4.36	13.32
1093		254	5.25	13.95	6.53	7.10	4.38	14.25
1213		225	5.35	11.95	5.66	7.00	2.57	13.39
1222		232	5.15	12.05	6.07	6.85	4.17	12.25
1266		222	5.40	11.90	6.12	7.02	3.85	12.55
1327		210	5.15	10.75	5.72	6.55	3.42	11.65
1404		219	3.95	12.30	5.81	6.65	3.96	11.45
1456		211	4.95	10.75	5.75	6.25	4.17	11.03
1478		216	5.10	11.35	5.75	6.60	3.85	11.75
	Means	228	5.04	12.21	6.11	6.87	3.83	12.66

W E E K L Y R E P O R T S
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Belle Fourche

Under date of December 3 Mr. Aune reported as follows:

"The hog experiments, comparing white corn, yellow corn, and ground barley self-fed with alfalfa pasture, have just been completed.

"The feeder lambs made better gains during the first 30 days than were expected considering the unfavorable weather that has prevailed since the experiment was started. For the 30-day period the average gain per head was 8.2 pounds and the average daily gain per head was .27 pound, the grain fed per head daily being ½ pound. They are now consuming nearly one pound per head per day. This will be increased to 1.5 and 1.75 pounds, which is about the limit.

"The sugar beets in Field A were finally gotten out of the ground.

"The yields from the fertilizer experiment with sugar beets are given in the following tables. The P_2O_5 seems to show an increase in yield in all cases. The test conducted in Field G in connection with sweet clover pasture and manure, where the ground was well supplied with plant food, resulted in no increase in yield where the fertilizer was applied."

Yields of sugar beets in the fertilizer experiment (Field G), Belle Fourche Field Station, 1929

Row No.	Preceding crop	Fertilizer P_2O_5	Stand per acre	Yield per acre	Per cent sugar	Per cent purity	Weight per beet	Sugar per acre
			plants	tons			ozs.	lbs.
1 - 16	Sugar beets	Treated	22,887	17.62	18.4	88.7	25	5,751
17 - 40	" "	Untreated	23,767	14.42	19.5	87.6	19	4,926
41 - 52	" " manured	Treated	21,400	19.50	17.2	87.2	29	5,849
53- 64	Sugar b. manured	Untreated	23,500	19.25	16.7	87.4	26	5,519
65 - 70	Sweet clover pastured	Treated	23,100	19.67	16.1	84.6	27	5,359
71 - 76	Sweet clover pastured	Untreated	23,967	19.17	15.0	83.6	26	4,808
Maximum	---	---	23,967	19.67	19.5	88.7	29	5,849
Minimum	---	---	21,400	14.42	15.0	83.6	19	4,808
Average	---	---	23,103	18.27	17.1	86.5	25	5,385

Fertilizer used in this experiment was Anaconda Treble Superphosphate, applied at the rate of 40 pounds of plant food per acre.

Belle Fourche (cont'd)

Yields of sugar beets in the fertilizer experiment, Belle Fourche Field Station, 1929

Fertilizer formula NH_3	P_2O_5	K_2O	Plot No.	Stand per acre	Yield per acre Gross	Yield per acre Net	Per cent sugar	Weight per beet	Sugar per acre
					tons	tons		ozs.	lbs.
--	--	--	Check	25,272	20.88	15.66	15.6	19.8	4,173
0	20	0	X	23,736	19.20	14.40	17.4	19.4	4,360
0	20	0	Y	22,704	19.68	14.76	15.9	20.8	4,027
0	20	0	Z	24,144	19.68	14.76	17.3	19.6	4,530
--	--	--	Check	19,608	14.64	10.98	15.5	17.9	2,883
0	20	0	1-A	22,968	23.04	17.28	17.4	24.1	5,418
0	20	0	1-B	25,104	20.76	15.56	16.2	19.8	4,335
--	--	--	Check	26,208	14.70	11.02	16.8	13.5	3,225
0	16	4	2	25,584	18.00	13.50	16.2	16.9	3,814
4	16	0	3	25,776	17.76	13.32	17.3	16.5	4,070
--	--	--	Check	25,992	15.12	11.34	16.0	14.0	3,092
0	12	8	4	26,304	18.00	13.50	16.6	16.4	3,922
4	12	4	5	25,416	18.24	13.68	17.7	17.2	4,296
8	12	0	6	25,200	16.80	12.60	16.6	16.0	3,635
--	--	--	Check	24,072	13.80	10.35	15.3	13.8	2,682
0	8	12	7	26,592	16.56	13.91	16.0	16.7	3,819
4	8	8	8	26,280	16.80	14.11	16.7	17.2	4,105
8	8	4	9	26,160	16.80	14.11	16.7	17.3	4,143
--	--	--	Check	25,236	13.50	11.34	16.3	14.4	3,213
12	8	0	10	25,464	18.00	15.12	17.3	19.0	4,567
0	4	16	11	23,400	14.40	12.10	16.2	16.5	3,379
4	4	12	12	23,976	16.08	12.71	16.3	17.0	3,604
--	--	--	Check	24,936	16.02	12.65	15.3	16.2	3,321
8	4	8	13	25,128	18.96	14.98	16.0	19.1	4,147
12	4	4	14	24,696	21.00	16.58	17.7	21.5	5,218
16	4	0	15	25,248	20.64	16.31	17.3	20.7	4,960
--	--	--	Check	24,000	18.66	14.74	16.0	19.7	4,014
0	0	20	16	25,512	20.40	16.12	16.7	20.2	4,706
4	0	16	17	24,168	20.52	16.21	16.6	21.5	4,553
8	0	12	18	24,600	18.48	14.60	17.2	19.0	4,424
--	--	--	Check	25,524	16.50	13.03	16.6	16.3	3,742
12	0	8	19	24,000	17.64	13.93	17.0	18.6	4,149
16	0	4	20	23,928	17.64	13.93	18.4	18.6	4,521
20	0	0	21	25,416	17.64	13.93	17.1	17.5	4,116
--	--	--	Check	25,104	18.36	14.51	17.0	18.5	4,307
Maximum			---	26,592	23.04	17.28	18.4	24.1	5,418
Minimum			---	19,608	13.50	10.35	15.3	13.5	2,682
Average			---	24,784	17.85	13.93	16.6	18.0	4,042

Notes: On plots X, Y, and Z Anaconda Treble Superphosphate was used at the rate of 20 pounds P_2O_5, 40 pounds P_2O_5, and 80 pounds P_2O_5, respectively. On plot I-A Treble Superphosphate was used at the rate of 40 pounds P_2O_5 per acre. On plot 1-B 16% superphosphate was used at the same rate as on plot 1-A. On all other plots where fertilizer was used it was applied at the rate of 200 pounds (40 pounds plant food) per acre. Carriers of plant food in commercial mixtures: NH_3, $\frac{1}{2}$ each from nitrate of soda and sulphate

Belle Fourche (cont'd)
Notes (cont'd)

of ammonia; P_2O_5 all from 16% superphosphate except plot 1-A; K_2O all from sulphate of potash.

The tare ranged from 16 to 25% of the gross yield, with an average of 22%. The per cent purity ranged from [illegible] 84.6 to 90.1, with an average of 86.9%.

Prosser

Report for the two-week period ending December 7

An important development to several towns of the Yakima Valley this year has taken place in the opening of the natural gas field in Benton County. The Northwestern Natural Gas Company is now operating six producing wells. The gas from these wells is piped into Grandview, Prosser, and Sunnyside. A six-inch pipe has been laid from the gas field into these towns. The field is about 30 miles northeast of Prosser. The company claims to have an output of 600,000 to 800,000 cubic feet of gas daily. The gas was first made available in Prosser on November 19, 1929. Since then about 30 customer services have been installed in Prosser and Grandview.

As the gas field is further developed, pipe lines will probably be laid into Yakima and Walla Walla. The company reports an investment of $1,200,000 in pipe lines, pumping stations, wells, and leases.

There are two theories as to the source of this gas. One is that it comes from decaying vegetable and animal matter deposited in bygone ages between the flows of lava, of which there were three. The other theory is that it is being given off from volcanic activity within the earth. The gas contains a high percentage of methane and is rated as 900 British thermal units per cubic foot.

All the productive wells in the field encountered gas at a depth of 700 to 800 feet.

C. C. Wright.

San Antonio

During the two-week period ending November 30 meteorological data were recorded as follows:

Item	Week ending November 23	Week ending November 30	Month of November	22-year average
Temperature				
Maximum	75	80	82	---
Mean maximum	57.6	60.4	64.2	---
Minimum	28	30	28	---
Mean minimum	36.7	38.4	43.1	---
Mean	47.1	49.4	53.6	60.6
Greatest daily range	37	37	37	---
Precipitation (inches)..	.14	1.00	2.95	2.00
Aspect of the sky:				
Days clear	3	3	17	---
Days partly cloudy ..	1	0	1	----
Days cloudy	3	4	12	---
Evaporation (inches) ...	---	---	2.62	3.20
Wind movement (miles per hour)	---	---	3.1	2.9

San Antonio (cont'd)

The weather of the last two weeks has been unusually cold. The mean temperatures have been very low, the mean for the month being 7° below the 22-year average. It is also by far the coldest November ever recorded at this station. Considerable rainy weather has accompanied the cold, and the precipitation for the month is above normal. Two rains of practical importance occurred during the month in addition to the frequent showers. These rains improved pastures materially and provided moisture for seeding of small grains on the rotations. Vegetation has suffered from the cold weather, and most all deciduous ornamentals have lost their leaves. Field peas in the rotations have emerged but are making slow growth.

Fall plowing of rotation plots has been practically completed. A number of plots were manured before plowing as scheduled.

Cotton was picked from a number of plots in the cotton-rootrot experiment in Field C-6. Yields will be small but were sufficient to justify picking.

The partition between the two office rooms in the office building was torn out, making one large room, to give better circulation of heat.

During the wet weather corn shelling and miscellaneous repair work was done.

The following meteorological data were recorded during the two-week period ending December 14:

Week ending	Temperature (degrees F.)					G. D. R.	Precipitation	Aspect of the sky		
	Maximum		Minimum		Mean			Clear	Partly cloudy	Cloudy
	Absolute	Mean	Absolute	Mean						
							inches	days	days	days
Dec. 7	75	62.9	22	33.0	47.9	37	----	5	2	0
" 14	81	77.9	50	60.1	69.0	28	1.51	3	2	2

The unusually cold weather of November continued into the first few days of December, with a minimum temperature of 22 on the 2d and a mean of 47.9 for the week. Following this the weather changed rather rapidly to warm spring-like days. The mean of the second week was 69.0 as compared with the 22-year mean of 51.4 for December. The sky was clear during most of this period. There was a rain of 1.39 inches on the night of the 14th. It fell rapidly and considerable run-off occurred.

The warmer weather of the last two weeks combined with abundant moisture has caused good growth of fall pastures. Small grains in the rotations and Field C-5 emerged to good stands. The variety test of small grains was planted on AB-8 and has emerged. Field BC-3 and E-3 were planted to oats after preparing the ground with the tractor disk and harrow. Fall plowing has been completed with the plowing of F-3, A-3, the Herbst tract, C-6, and C-7.

The pasture at the farm residence was plowed, disked, harrowed, and planted to wheat. Field C-3 was disked and harrowed with the tractor in preparation for flax, but is still too rough and cloddy for a good seedbed. The rain of the past week should enable further preparation soon.

I. M. Atkins.

Yuma

The maximum temperature for the two-week period ending December 7 was 82, minimum 27, and greatest daily range 45.5. No precipitation was recorded. The meteorological data for the month of November are as follows: Mean maximum 78.3, mean minimum 40, maximum 89, minimum 27, greatest daily range 48.5, and precipitation 0. Killing frosts occurred on the 14th, 23d, and 25th.

Except for a small amount that requires a second picking, all the cotton on the station has been picked. Most of the cotton plots in the rotations are now being prepared for crops, as alfalfa, sweet clover, and barley. Many of the plots will again be planted to cotton for the second and third consecutive years.

The ginning of cotton in the Yuma Valley is on the decline. During the past week only 1,554 bales were ginned, which make a total of 25,382 bales ginned this season.

Recent station visitors were J. S. Townsend, of the Office of Cotton, Rubber, and Other Tropical Plants, and G. A. Wiebe, of the Office of Cereal Crops and Diseases.

Arthur T. Bartel.

M I S C E L L A N E O U S

THE TREND OF COTTON YIELDS IN THE SALT RIVER VALLEY

The following statement regarding cotton production in the Salt River Valley of Arizona, with particular reference to declining yields, is based upon experiences and observations in that region covering the last thirteen years. It does not take into account the new situation caused by the appearance of the pink bollworm, which was recently discovered. The purpose of this statement is to put on record conclusions with respect to the character of the production problems that have developed on the irrigated lands of the Salt River Valley. It appears that these production problems are related to the methods of irrigation and of crop rotation that are in general use; and while the results of these methods are more evident in cotton than in other crops, it is believed that this is because we know the plant reactions of cotton better than we do those of other crops.

Cotton first became an important factor in the agricultural program of Maricopa County in 1917 when 29,000 acres were planted. For the next three years there was a steady increase in the acreage until in 1920 there were 180,000 acres in cotton. In 1921 the acreage was reduced to about 74,000 largely because of the financial depression that occurred in 1920, but since that time the acreage devoted to the crop has increased until in 1929 it is approximately 145,000 acres.

Pima was the variety exclusively grown in the county up to and including 1921. Beginning in 1922 a varying percentage of the acreage upon which cotton was grown has been planted to different varieties of Upland, with Acala predominating. The introduction of these Upland cottons was due in part to a narrowing of the price differential between Pima and Upland during the financial readjustment following 1920, but it was materially influenced also by a very definite decline in the yields of Pima cotton as compared with those first obtained.

It should not be assumed that this problem of obtaining satisfactory yields is of recent origin. In December 1925 I had occasion to report as follows on the general cotton situation in the Valley:

"For the past four years there has been a gradually increasing dissatisfaction among a high percentage of the Pima growers over the returns from their plantings. Naturally up to 1925 this can be explained by the decline in prices from those obtained prior to 1920, but in spite of this many loyal Pima advocates who have consistently grown this variety since its introduction would still be reasonably satisfied were they able to secure the yields more nearly equal to those previously obtained. This condition applies throughout the Valley as a whole and includes such as the Tempe and Scottsdale districts where Pima cotton has been successfully grown for several years."

The significant features of the present situation may be illustrated by giving the yields obtained by some of the more experienced cotton growers in the central part of the Valley who have a fairly reliable record of their yields. A large part of this information was furnished by Mr. George Harrison. During the four-year period 1916 to 1919 one grower averaged .79 bale per acre. For the next four-year period, 1920 to 1923, his yields averaged .43 bale per acre, and for the four-year period 1924 to 1927 were only .26 bale per acre. Another grower produced an average of .78 bale per acre from 1916 to 1919. In

The Trend of Cotton Yields, etc. (cont'd)

1920 his yield was less than .5 bale per acre, and yields declined annually from this time until 1926 when the yield from 90 acres was less than one-third of a bale per acre. He has grown no cotton since 1926. A large operator, who controls more than 2,000 acres, reports as follows:

"On the average the yields began to fail appreciably after three to six years, the lighter soils failing to produce on a paying basis after three years and the heavier soils beginning a steady, substantial decline after about the sixth year. The falling off in yields on all types of soil when once started has been gradual and continuous until the company grows no cotton on its own account and expects to force its lessees to cease growing cotton."

Another grower who took an active part in establishing the Pima industry on a commercial basis ceased growing that variety after 1925 because of low yields and turned to Acala. The results obtained from this latter variety were so discouraging that for the last two years he has grown no cotton. He owns about 800 acres in the Tempe district, which was the center of the Pima cotton industry during the introductory period of its growth.

Another grower owned a ranch located about three miles south of Mesa on the base line road. The soil of this ranch is productive but heavy. For the first five years up to 1921 the owner was considered one of the most successful growers. He improved his property and built an $8,000 house. Beginning about 1921 his yields began to decline to such an extent that in 1923 he quit growing Pima, believing he could obtain better results with Acala. But this change did not improve his situation, and in 1927 the bank was obliged to foreclose on his property.

The foregoing are only a few of the many cases which could be quoted as typical of what has occurred on the older lands of the Salt River Valley where cotton has been featured in the planting program. Much of the land which formerly produced satisfactory yields of cotton has been devoted to other crops, which not infrequently have proven to be less profitable than would have been the case if it had been possible to continue to grow cotton with yields comparable to those formerly obtained.

These production problems have been notably more serious on the heavier soil types where the practice of applying light irrigations has been in effect. While it is true in some instances that satisfactory yields are now being secured on the heavier soil types by farmers who have specialized on cotton for a number of years, yet such cases are the exception rather than the rule. On the lighter, more open soil types less difficulty has been encountered in maintaining yields by the better farmers, particularly those who have practiced some form of crop rotation, and notably those who have used alfalfa in the rotation with the consequent heavier irrigation.

This decline of cotton yields has had a profound effect not only on the financial welfare of many farmers but also on the distribution of the cotton acreage throughout the County. During the early years cotton production was largely centered around the towns of Tempe, Chandler, and Mesa, which are located in the southern and eastern part of the Salt River Valley Project. The soil is generally heavy, but under proper management it was highly productive. Before the advent of cotton the land was largely cropped to alfalfa and grain. Pasturing was generally practiced. The water supply was ample, and it is believed that copious irrigation was then more general than it has been during

The Trend of Cotton Yields, etc. (cont'd)

the last few years. This decline in yields has reduced the acreage devoted to cotton on these and similar areas throughout Maricopa County until at the present time they have ceased to be the chief cotton producing centers, and in the Tempe and Chandler districts only isolated tracts are now planted to this crop. These changes, which have been gradual but definitely progressive, have resulted in shifting cotton production largely to those marginal areas where the soil is of a relatively coarse texture and to land recently brought under cultivation. Hence only under the most favorable conditions as to soil and management is cotton now grown successfully in the central part of the Salt River Valley Project, where it was formerly the chief crop and considered the foundation of the farmers' prosperity. Thus, not only has cotton ceased to be grown on large areas which were formerly productive but past experiences indicate that on the major portion of the land now devoted to the crop comparable production problems will develop unless a radical change takes place and that it is only a question of time when cotton will no longer be a crop of importance in the agricultural program of the Valley.

There is another aspect of this subject which has had an extremely adverse effect on the cotton outlook. Since 1922 a substantial part of the acreage in cotton has been planted to Upland varieties. Where good farming methods are followed and the land carefully selected, the yields of Pima are at present equal to those formerly obtained; and a recent economic survey has clearly demonstrated that this variety over a period of years is much more profitable than any variety of Upland cotton. In spite of this fact, beginning in 1912 various varieties of Upland cotton have been grown, with Acala predominating. As was previously stated, this development was influenced somewhat by a lower price differential paid growers for Pima lint as compared with Upland; but it was apparent to those who have watched the progress of the cotton industry that the change of varieties was due largely to the marked decline of Pima yields. Many growers believed that the difficulties encountered with the Pima variety would be largely if not wholly solved by changing to Upland, but unfortunately the expected advantages did not materialize. The same difficulties have been experienced with the Acala variety, which repeated tests under carefully controlled conditions has proven to be better adapted to the Salt River Valley than any of a large number of other varieties tested. But in spite of these facts, there has been a general belief that the difficulties encountered could be solved by a change to still another variety.

The effect of this belief on the sentiment throughout the Valley has been to overlook the importance of the problems that are related to good farming practices and to focus the attention of the growers almost exclusively on the varietal question. One unfortunate evidence of this has been the "bootlegging" of planting seed into the Valley. While it cannot be said that evasion of the quarantine regulations has been encouraged, yet it is evident that the dangers of this method of securing new and supposedly superior varieties has been greatly minimized. Although it cannot be stated definitely that the recent unfortunate outbreak of the pink bollworm in the Valley is a result of this situation, there is good reason for believing it may have been introduced in this manner.

The Trend of Cotton Yields, etc. (cont'd)

The question as to the extent that cotton is an asset in the irrigated valleys of the Southwest should be considered. Even with the relatively low average yield now being obtained in the Salt River Valley, a recent economic survey clearly shows that Pima cotton is more profitable than any of the other staple crops grown. When it is incorporated in a constructive rotation with alfalfa and the increased yields resulting therefrom are taken into consideration, the crop is even more profitable than a combination of cantaloupes, lettuce, and alfalfa. The only crops which show distinctly superior advantages from the point of view of gross and net returns are dates, citrus, and small acreages of deciduous fruits totaling at present less than 7,000 acres out of 220,000 acres now under cultivation on the project. Only the marginal areas are adapted to the production of citrus and dates because of temperature limitations. Thus it appears that for many years to come it will be necessary to produce staple crops on a very large percentage of the land now under irrigation, and none of these crops are at present as profitable as Pima cotton. If improved farming practices were in effect, the superiority in net returns that Pima cotton would show over other crops would be distinctly greater. On our Yuma Field Station, where it is believed that the climatic conditions are somewhat less favorable than in the Salt River Valley, yields of approximately a bale to the acre are consistently harvested from the better rotations. These high yields are the result of improved cultural and irrigation practices. Comparatively large yields have been harvested at the Sacaton Field Station for many years.

There can be but little doubt that cotton is an important factor in the success of the Rio Grande Project where out of a total irrigated area of approximately 139,000 acres 104,000 were in cotton in 1928. The increase from 1926 to 1929 is 164 per cent as compared with the 1921 to 1925 period. The total irrigated area on the Yuma Project is approximately 60,000 acres, and from 1926 to 1929 the area devoted to cotton has averaged 30,430 acres, an increase of 19 per cent over the 1921 to 1925 period.

The acreage cropped on the Salt River Valley Project is close to 220,000, and from 1926 to 1929 71,156 acres have been devoted to cotton production, a decrease of 8 per cent as compared with the 1921 to 1925 period. On the other hand, the cotton acreage outside the Salt River Valley Project has increased from 16,540 in the period 1921 to 1925 to an average of 46,230 from 1926 to 1929, an increase of 179 per cent. This increase in acreage outside the Salt River Valley Project has taken place almost wholly on the approximately 100,000 acres of virgin land brought under irrigation within the last five years and on which production problems have not yet developed.

Cotton has only recently become an important crop on the Elephant Butte Project where not much was grown prior to 1922. In the Yuma Valley irrigation practices and soil conditions are quite different from those on the Salt River Project. These differences seem to account for the larger yields and greater returns from cotton in these two areas as compared with the Salt River Valley.

The discussion up to this point has been devoted largely to the past and present conditions of the cotton industry on the Salt River Project. It is proper that consideration should be given to the difficulties which have been encountered and which have depressed yields

The Trend of Cotton Yields, etc. (cont'd)

to the extent that it has been questioned whether the industry is now an asset to the community.

During the seven years that I was in charge of the ranching operations of the Southwest Cotton Company I gave considerable thought to the problem, for large yields were obviously directly associated with the best interests of the company. For a time it was my belief that yields could be maintained or increased by a proper system of crop rotation, using alfalfa as a soil improvement crop. On the lighter, more open soil types which take water readily, such as those of the Marinette ranch, satisfactory results were obtained by this practice. On the other hand, on the more compact, tighter soil types the beneficial results of crop rotation were less marked. The difficulties encountered were manifested by the plants in three ways:

First, by excessive shedding of the squares, apparently resulting from water stress conditions. While temperatures are moderate shedding is not noticeable; but as they become materially higher and particularly if the changes are abrupt, shedding is more severe. In this connection it is of interest to note that shedding is usually more severe on the heavier soil types which are impervious to water. This may be illustrated by the average yields on the Litchfield ranch as compared with the Marinette ranch of the Southwest Cotton Company. The soil on the Litchfield ranch, particularly on the eastern side, is heavy and impervious; but on the western side there is much coarser material in the soil mass, which is of such a texture that it has marked cementing qualities. At Marinette, on the other hand, the soil is a sandy loam and takes water readily. At Litchfield the average yield for the eleven-year period 1918 to 1928 was 194 pounds, while at Marinette the average for the same period was 267 pounds of lint per acre. If there is any difference in the farming practices on the two ranches, they have been better at Litchfield than at Marinette. On the Goodyear ranch, which has a soil about intermediate between the two other ranches, the average yield for the same period was 235 pounds of lint per acre.

Second.- Next to shedding the most important factor in reducing yields has appeared to be small bolls. Accompanying the complaints of low yields are statements that the bolls are smaller than they were in earlier years. This has led some growers to believe that the Pima seed stock is "running out." Repeated tests have demonstrated that the planting seed now used is as good as, if not better than, that which was available prior to the time these difficulties appeared. It has appeared to those who have followed impartially the development of the Pima industry since its inception that the bolls are not as large as formerly. It has also seemed that there is a correlation between the size of the bolls and the amount of shedding. For the purpose of throwing some light on this question, five 100-boll samples were collected in 1925 at Litchfield where production difficulties were apparent and compared with five lots collected at Marinette. At the same time a census of the number of forms shed was taken. The results showed that at Litchfield the five 100-boll lots averaged 11.8 seeds per boll and the shedding of forms was 44 per cent of the total. At Marinette, on the other hand, the average number of seeds per boll of a like number of plants was 16.4 and the shedding of forms was only 22 per cent. In

The Trend of Cotton Yields, etc. (cont'd)

conducting this investigation the less productive fields at Litchfield and those producing relatively satisfactory yields at Marinette were selected. It appears, therefore, not only that unfavorable conditions cause shedding, but there is considerable evidence that boll size is also reduced.

Third.- Accompanying these production problems of shedding and small bolls another serious difficulty has been encountered. This disorder has been described as "crazy top." It was first noticed about 1919, but little attention was given to the disease until 1922 when it was sufficiently widespread to be noticed by a number of growers. Since 1922 the disorder has become so prevalent throughout the Salt River Valley that cotton yields have often been materially reduced by it. The plants show the effects of the disease by varying degrees of abnormality in the vegetative growth and usually by sterility at the top of the plant. That the injury is quite closely correlated with stress conditions occurring during midseason is indicated by the time it appears, which is never in the early summer when the plants are small and the temperature moderate. Observations made over a period of years indicate that small bolls and severe shedding may be a preliminary expression of the crazy top disorder, and only in its advanced stages are the other abnormalities of plant growth apparent.

King has demonstrated that the injury resulting from crazy top may often be greatly reduced by improved water penetration, and there is evidence to indicate that alfalfa grown on the land for a few years will correct the trouble. As the growth of alfalfa on land is recognized as a material aid to more complete water penetration, it may be that this is largely the purpose served.

It has been observed that this disorder has a material effect on the size of the bolls by reducing the number of seeds. This is confirmed by recent observations made by Mr. C. J. King, who reported that the mean weight of 25 bolls of Pima from normal plants was 3.25 grams, while that of a similar number collected from plants definitely injured by the crazy top disorder was only 0.77 grams, or less than one-fourth the weight of those grown under approximately normal conditions. The mean number of seeds in the Pima bolls where the disorder was not apparent was 16.9 per boll, whereas the mean number from plants definitely injured by the disease was only 6.1. An examination of the lint by Mr. Harrison, made by the Baer sorter, showed that the lint from crazy top plants was shorter and distinctly more wasty than that from normal plants. It is evident, therefore, not only that the size of the bolls is reduced where shedding is prevalent, but that they are also materially smaller when crazy top is a factor, and that these unfavorable growth conditions affect adversely the quality of the lint.

It is often observed that these conditions could be greatly improved by a proper system of crop rotation and by improved irrigation practices, so that more complete water penetration is attained. Unfortunately, however, even adequate water penetration and a rotation with alfalfa do not always solve the problems of securing profitable yields of cotton, irrespective of the variety grown. This has led me to believe that there may be a nutritional problem involved that is not at present recognized.

The Trend of Cotton Yields, etc.(cont'd)

It has already been noted that these production problems have been definitely more apparent on heavier soil types where adequate water penetration is difficult to obtain even under efficient management. Ordinarily, light sandy types of soil are less productive, at least unless given special treatment, than those containing a relatively high percentage of fine material. This was generally true of the Salt River Valley lands during the earlier years. The cotton yields obtained soon after the introduction of the crop were no exception. However, these heavier soil types eventually became quite generally increasingly less productive until the yields obtained often did not cover production costs, and cotton growing each year was more definitely confined to the open, permeable soils or generally to those areas where the problems of securing relatively large yields had not reached the acute stage. The marked tendency of cotton yields to decrease seemed to justify an investigation to ascertain to what extent commercial fertilizer could be utilized in correcting the difficulties encountered. This work was begun in 1920, and the results were published in Arizona State Bulletin No. 129 in 1929. The results from a number of experiments on various soil types from 1920 to 1928 on the whole do not show sufficiently outstanding results to justify the practice. However, it is highly significant that such beneficial results as were obtained were from the lighter soil types, and the bulletin states in the conclusion that "the heavier soils did not show any significant increases in yield from the use of commercial fertilizers." If it is true, as seems likely, that in many if not most instances on the heavier soils harmful quantities of salts are being accumulated in the soil solution due to inadequate irrigation, beneficial results certainly could not be expected from the application of ordinary commercial fertilizers. Using various commercial fertilizers and barnyard manure in a test with Pima cotton at the Mesa State Station, covering a three-year period, the average yield was as follows: Check plots, 226; those receiving commercial fertilizers, 217; and the two on which stable manure was applied, 242 pounds of lint per acre. The soil is classed as a clay loam. This conforms to the results of a number of other tests that have been made on somewhat similar soils; namely, on the heavier soil types ordinary commercial fertilizers have tended to depress yields, and although stable manure indicates a slight improvement, the increase is not so pronounced that its use can be strongly urged.

It should not be assumed that similar production problems are not now being encountered or are not likely to occur in other irrigated areas of the Southwest where cotton is featured in the planting program. It is altogether probable that in these other regions there will be a repetition of what has occurred in the Salt River Valley. It is not reasonable to suppose that a solution is to be found in substitute crops. All the evidence obtainable indicates that the continued success of these irrigated projects must be based upon a general appreciation of the fundamental principles of the alkali problem as well as the importance of the adoption of proper systems of crop rotations. Failure to meet squarely the issue of declining yields or to assume that a solution is to be found in substitute crops or other agricultural enterprises indicates a lack of constructive leadership.

The Trend of Cotton Yields, etc. (cont'd)

In reviewing and summarizing the cotton situation in the Salt River Valley the following statements may be made:

Before serious production problems appeared cotton was a profitable crop and a distinct asset to the community. At present owing to low yields its value is often questioned. It is evident that cotton yields have declined materially in the last few years, and large areas from which good yields were formerly harvested are now relatively unproductive. The areas now devoted to cotton are largely confined to:

(1) Newly developed lands upon which production problems have not yet appeared.
(2) The more open soil types where adequate water penetration is readily obtained.
(3) Well managed farms which produce profitable yields because the rotational practices and sound methods of irrigation have not impaired the productivity of the soil.

So little attention has been given to the problems of maintaining yields comparable to those formerly obtained that many farmers have come to believe that it is a question of variety and that changing from the present variety to one supposed to have mysterious, unknown qualities will correct the difficulties encountered. No evidence has been produced to show that any advantage occurred when Upland was substituted for Pima or that any known variety of Upland is superior to Acala.

Low yields are manifested by the plants in three ways: extreme shedding of the squares, small bolls, and the appearance of the crazy top disorder, or often a combination of all three. These difficulties are less common on the more open soil types and are less marked on the other soil types when a proper crop rotation including alfalfa is used. In other instances improved irrigation practices have had a markedly favorable influence on the behavior of the plants.

In certain cases even where a proper system of crop rotation has been adopted and apparently sound irrigation practices have been in effect there have been extremely unsatisfactory results. This most often happens on the soils of fine texture.

Commercial fertilizers have been tested for a number of years, using different formulas, with no consistently outstanding beneficial results. Stable manure has been applied in conjunction with commercial fertilizer with fairly satisfactory but not sufficiently striking results to develop interest or justify general use.

Throughout the preceding pages the discussion has been confined to the matter of yields. However, it should not be assumed that the production problems which have developed have had no effect on the quality of the staple. It has been found that usually there is a definite correlation between yields and length, strength, character, and uniformity of the lint. A satisfactory quality of lint cannot be expected where growth conditions are so unfavorable that yields are definitely adversely affected.

Even if it were granted that cotton may be entirely eliminated from the agricultural program of Maricopa County without disrupting the economic balance, which appears unlikely, there is no evidence to indicate that comparable production problems will not appear with substitute crops. In other words, it is important to recognize that fundamentally unsound farming methods and a change from one crop to another will not correct the trouble.

The Trend of Cotton Yields, etc. (cont'd)

The introduction of Egyptian cotton into the Southwestern United States promised to be one of our outstanding achievements. The maintenance of pure seed stocks by careful breeding methods has made available a variety adaptable to many of the irrigated valleys of the Southwest. It is a sad commentary that at the end of an investigational program covering a period of over twenty years and after the expenditure of hundreds of thousands of dollars, this excellent work is about to be largely nullified because only the most casual consideration has been given to the irrigation and cultural requirements of the crop.

S. H. Hastings.

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Scotts Bluff

Yuma

Miscellaneous